## \$10,000 Prize Contest - See Page 29

# Popular Science

FOUNDED NO 1872

INVENTIONS
DISCOVERIES
RADIO
AUTOMOBILES
AVIATION
HOME WORKSHOP



Flying Sailboat-the Newest Marvel of the Air

AUGUST

25 CENTS





## Vital to every radio fan

In a radio set, it is the tube that detects the sound—that amplifies the sound—that determines in large part the quality and volume of the sound. Therefore the tube—intricate of mechanism and delicate to make—is the vital spot in every set. And it always pays to be sure you use genuine Radiotrons—made with experienced precision-

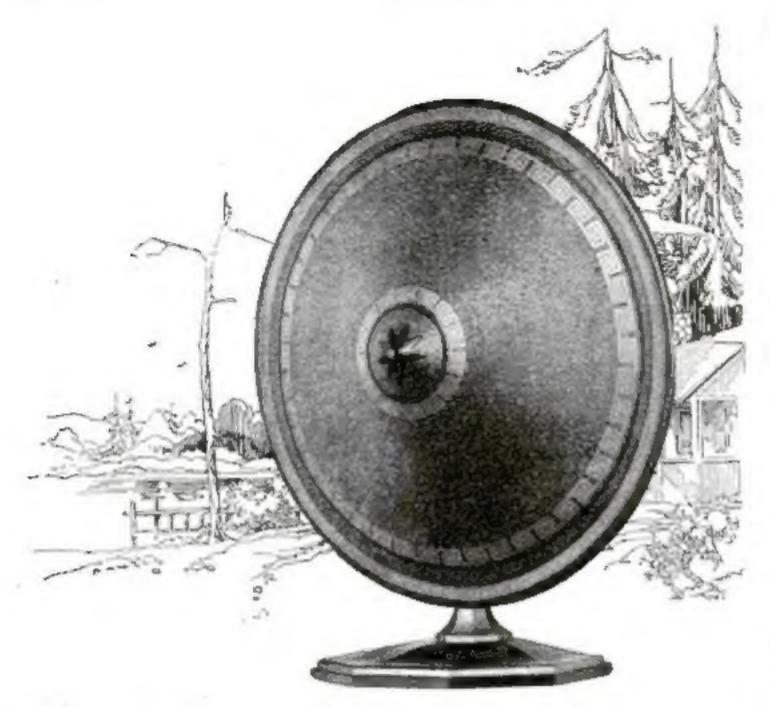
Build any circuit—simple or complex. Buy any set, plain or fancy, simply boxed or elaborately cabineted. But give it every chance to achieve its best—with genuine Radiotrons. Be just as careful when you replace tubes, too. Always see for yourself that each one bears the identifying marks of a Radiotron: The word Radiotron and the RCA mark.

Radio Corporation of America
Chicago New York Sun Francisco



Radiotron

PRODUCED ONLY BY RCA



## The Crosley Musicone

a startling improvement in looks and tone over loud-speakers Already replacing thousands

In camp or home, this remarkable development of radio reproduction will greatly increase your delight in radio.

It is a new idea. It diffuses the sound. Upon hearing it for the first time one is at loss to locate the source of the music. Its perfection of reproduction is uncannily real. Its price, like all Crosley products, is very low because of the half-million production

plans under which it is being built. Hear it at all Crosley dealers now. Creeky awas and operates station WLW, Quaincell, the first remotely controlled super-power broadcasting station.

Cooley manufactures receiving sets which are licensed under Armstrong U. S. Patent No. 1,113,149, and priced from \$14.50 to \$65, without accessmins.

> The Crosley Radio Corporation Powel Crosley, Jr., President

> > 617 Sassafras Street, Cincinnati

Better~Costs Less

#### The Marvels of Radio! Incredible to those who don't know!



### The Crosley 1-Tube 50

Crosley's development of the famous Armstrong regenurative circuit enables you to "roun" the country and enjoy the thrill of picking up distant stations just as though you owned a multi-tube set,-all with one tube and at \$14.50, without accessories.



#### 2-Tube Crosley 51

Same as wonderful Crosley 50 with additional tube amplifier. Local and nearby stations on loud-speaker always and distance up to 1500 miles under average conditions. Much greater range with head phones. \$18.50, without accessories.



#### 3-Tube Crosley 52

A larger set for those who want greater reception range on the loud-speaker. Operates on three tubes, using wet or dry batteries. Consistent loudspeaker range 1500 miles or more. \$30, without accessories.



#### The Crosley Trirdyn Special

3-Tubes do the work of 5

A unique circuit combining tuned radio frequency, regeneration and reflexed amplification that equals in results the work of 5 and 6 tubes. None ##-radiating, 465 without accessories.

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## Popular Science Monthly

The Magazine of Invention and Discovery

AUGUST, 1925; Vol. 107, No. 2 25 cents a Copy; \$2.50 a Year



Published in New York City at 250 Fourth Avenue

## Coming Next Month

Wild Beasts at Close Range—How a daring big-game hunter made astonishing flashlight photographs of wild animals in the jungle. You won't want to miss these thrilling pictures in next month's issue.

Secrets of Successful Gear-Shifting-Another of Martin Bunn's fascinating "Gus and Joe" stories, in which Gus, the mechanic of the "Model Garage," explains valuable little tricks of gear-shifting that will help you get the most satisfaction out of driving.

A New Aid for Aviators-The story of a remarkable new instrument that enables airplane pilots to determine exactly the deviation of their craft from the laid-out course of flight as the result of side winds.

The Fourth Set of \$10,000 Contest Pictures-You still have plenty of chance to win one or more of the big cash prizes in our remarkable \$10,000 "What's Wrong" Contest. The July Contest is still open for entry; the August Contest appears on pages 29, 30, and 31 of this issue; and the September contest will be published next month. And, in addition, you still have as good a chance as anybody in the Grand Prize Contest. Turn to page 29 of this issue and read about it.

More than 200 other fascinating articles and pictures, giving you all the news of radio and engineering, science and invention, strange and unusual things people are doing, together with practical ideas for the automobile, the home. the home workshop, and the use of tools and machinery

Commander Le Prieur of the French Aimy Avil tion Service, with his invention known as the 'navigraph," which tells airplane pilots the deviation of their craft from the laid-out course of flight, due to side winds



### POPULAR SCIENCE MONTHLY

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And Other Timely Articles and Pictures



## Daring Young Men Needed in Aviation

Aviation in America is on the threshold of an amazing new development. The prediction of ploneers is now an actuality—for in the past few months the newspapers have announced the establishment of gigantic commercial air lines. The biggest capital and business forces in the world are behind this enterprise. And now, even in the beginning, thousands of young men are needed. For those who can qualify there will be thousands of highly paid Jobs which will lead quickly and surely to advancement and success.

THERE is no field of work in the world today which offers such amazing opportunities to young men of daring and who love

adventure as does Avintion. Although still in its infancy, there is a crying demand in Aviation for young men with courage, nerve and self reliance. For those who can qualify there will be thousands of highly paid jobs which will lead quickly and surely to advancement and success.

#### Big Opportunities Await the Trained Man

Look over the fields of work which are open

to the young man today. You will find that Aviation is the ONE FIELD that is not overcrowdedthe ONE FIELD in which there is plenty of room at the top. Think of it! Only 21 years ago Orville and Wilbur Wright made the world's first airplane flight. Now airplanes

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### CHRISTIANITY ON BROADWAY

Excerpts from editorial in The Daily Reporter, White Plains, N.Y. By W. Livingston Larned

AN unusual project has been set in motion in New York. A "Business Building" is to rise on Broadway, at 173rd Street, dedicated to Christianity. To be known as the "Broadway Temple," it will contain a church, offices, auditoriums, schools, hotel accommodations, cafeterias, etc. And to a large extent, it will be erected by popular subscription. Individuals buy bonds, representing a 7 per cent investment and the total cost will be approximately \$4,000,000.

It is the first undertaking of its kind, and has so many amazing features that we will do well to observe some of these innovations. For this is a combination of church and skyscraper, Business and Christianity will be housed under one roof.

This Broadway Temple is, in a sense, a gigantic symbol of the uncontrovertible fact that Godliness can and should be continuous.

Broadway will be the better for a substantial reminder of this Holy Presence. From every vantage point, on sunny days, or nights filled with the sinister menace of storm, a high-flung cross of unquenchable light will be visible, glittering against the heavens. And he will murmur to himself reverently, "The Holy Spirit bides with me wherever I may be, walking or sleeping."

Broadway Temple will cover 26,000 square feet of foundation space, facing a whole block on Broadway. It will have a beautiful tower, 24 stories high; six million people will see a revolving cross of light, 34 feet high, on its topmost pinnacle. The church auditorium will seat 2200; there will be Sunday school rooms, a social hall and every modern convenience for religious and community work. An apartment hotel in the tower is to contain 644 rooms, public offices and dinlag halls. Apartments for housekeeping in the two wings will accommodate 500 persons. And there are stores fronting on Broadway.

In exploiting this magnificent and ambitious plan, its sponsors say: "A 5 per cent investment in your Fellow Man's Salvation, Broadway Temple is to be a combination of Church and Skyscraper, Religion and Revenue, Salvation and 5 per cent—and the 5 per cent is based on ethical Christian grounds."

Proadway Temple is more than a revolutionary idea, more than a sound investment, more than an architectural wonder of the age; it represents a spiritual stepping atone in man's climb upward to the Cross.

"Buy These Bonds and Let God Come to Broadway"

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The Directors who will conduct this business enterprise, the men with whom you, as an invessor, will be associated, are some of the knownt and best-known business men in New York. They are

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#### Why this is a SAFE Investment

Merely as an investment the Bonds of the Broadway Temple are inviting as a business proposition. Ewing, Bacon & Henry, real estate experts, in a letter to Donn Barber, the architect, set forth the following conservative estimate of income:

Total annual income . . \$596,090

Total expenses and interest and taxes . . 470,500

Leaving a net surplus for the bond holders of \$125,590 annually

	Samuel McRoberts, Treasurer, plear Temple Busiling Corporation. 149 Broadway, New York, N. Y.
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F.S. John D. Rochefeller, Jr., has agreed to take the last \$250,000 of the Bonds.

# What Electricity and Cooke Training Have Done for Me

By S. D. RISIO

President, the Modern Electric Co., Newburgh, N. Y.



VO years ago I was working at odd jobs, at small pay, without much future ahead of me. To-day, I am my own boss, the head of a prosperous electrical company in a busy city

of 35,000 people.

Two years ago I was just a laborer-untrained and hence not able to do more than work with my To-day I am a trained Electrical Expert, making three times as much money as I formerly dīd.

Two years ago I was a failure. To-day I am a success.

And I owe that Success to two things-Electricity and Cooke Training. Electricity offered me the opportunity; L. L. Cooke trained me and showed me how to make the most of that opportunity.

Yet I knew nothing about Electricity when I started.

I had been in America only two years when I enrolled for home-study training in Electricity with L. L. Cooke, Chief Engineer of the Chicago Engineering Works. knew nothing about Electricity, but I did know that it held wonderful opportunities for the trained man.

Although I had gone only to the fifth grade in school, and had been working in the fields ever since, doing almost no reading or studying, I found Mr. Cooke's lessons were easy to understand. I got busy on them right away and in three months had finished about half of his Course.

Then I decided to make the big jump—give up my job and go into business for myself as an Contractor. Electrical It was a real test for the Cooke Course, because I had learned all I knew about Electricity from it, and if it wasn't right I couldn't have succeeded in business. the lessons were right -100% correct on everything. So I began to get electrical jobs and soon I was wiring houses for Electricity. Every customer liked my work and said it was well done.

My business has been growing all the time.

Recently I completed a big wiring job on which I made over \$300 profit for myself. I have opened up a big Electrical Supply Store and repair shop in connection with my contracting work, and make good money on the side selling electric light fixtures, lamps, vacuum cleaners, flatirons, etc. I have several men work-

ing for me and always

Mr. Cooke has been like a friend and partner to me, as well as a teacher. He encouraged me to keep trying, when, if I had listened to the advice of others, I would have been tempted to quit, and he has worked on my problems and helped me and

> gave me good advice every step of the way.

His training paid for itself in less than four months after I enrolled through profits I made on Electrical Jobs. But I am still benefiting from his Course and will be as long as I live. He did not forget me when I had paid in full for his Course, but kept right on giving me help and service.

So my advice to any man who wants to be a success, and who is not satisfied with his present job, is "FIND OUT WHAT L. L. COOKE CAN DO FOR YOU-FIND OUT ABOUT THE OPPORTUNITIES

ELECTRICITY - AND THE ROAD TO BIG PAY WILL OPEN UP BEFORE YOU."

Mr. Cooke has published a big illustrated book called "The Vital Facts about Electricity" which he will send free on request, Just address, L. L. Cooke, Chief Engineer, Chicago Engineering Works, Inc., Dept. 3-C, 2150 Lawrence Ave., Chicago, Ill., and he'll send you this book and tell you all about Cooke Training. Send the Coupon to-day!



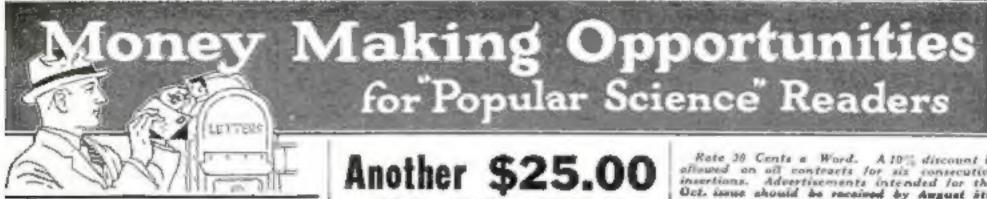
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AHLPLANE turnbuckies, new very methic for trung-up shating down or gates and radio wires send 25c for two samples postpaid. Write for our sales indictin it a free Johnson Airplane Supply Co., Dayton, Onio.

WANTED Airpi me Pilets and Mechanics. We have calle for a number of experienced airpiace pilots and mechanics also a limited number of apprentice helpers who are willing to work for flying training. No ters charged. All applicable are requested to be subscribers to Slipstream Aviation Monthly, The Commercial Fibers Magazine, at \$2.00 per year. Send application with subscribe line now, stating experience and if temperary work will be accepted. Slipstream Publishing Company, Dayton, Ohin.

#### BOATS AND LAUNCHES

BOATS that always go are propelled by Ford engines. Ford dope free to boat owners. Harry Hider, East Norwalk, Conc.

#### BUSINESS OFFORTUNITIES

TEN 2 cont stamps brings Free Particulars. Deak B. Surety Service Company, 551 Harvard St., Rochester, N. Y. FFART a Business of Your Own, 97c, profit out of every \$1. Opportunity of a lifetime. Success guaranteed. Articles contiens than it each, sell for \$1. Send 25c and I will send you complete plans and enough material to bring you \$20 when sold. Theodore W. Messick, Dept. 14MC, 1136 South Seventh St., Camden, N. J.

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Another \$25.00 IN PRIZES

for Popular Science Readers

To win one of these cash prizes is easy, and every reader is invited to enter this fascinating competition. Just write a letter of not over seventy words answering this

#### What Advertisement of "Money Making Opportunities" in this issue interests you most and why?

Here are the prizes we will pay for the ten nest letters answering the above question:--

First Prize . . . . . \$10.00 Second Prize . . . . . Third Prize . . . . . And 7 Prizes of \$1.00 each . . . . . 7.00

First read every one of the "Money Making Opportunities" advertisements on pages 6 to 15. Check the ones that interest you. Then read over the ones you have checked and decide on the one that interests you most.

Then write a short letter, not more than seventy words, telling us why the advertisement you pick interests you most. Remember that ten prizes will be awarded. You have a good chance of winning one of them. Be sure to mail us your answer before Aug. 1st. The prizes will be awarded, in the order of their merit, for the letters that are most interesting and best expressed.

The names of all the prize winners and the letters that win the first two prizes will be printed in this column in the Oct. issue. Address your prize letter to

#### Contest Editor

POPULAR SCIENCE MONTHLY 150 Fourth Ave., New York City

#### Last Month's Prize Winners

The first prize of \$10.00 goes to Mr. J. E. Baucom, of Wilson, Oklahoma for his letter on the advertisement of Walter McDonnell. Here is Mr. Baucom's letter:

Dear Nr. Detection of various advertisements in Money Making Opportunities and that of Walter McLionadil. 29 Petomac Beak Building, Wash. D. C. interested me most, because he offered just what I was looking for al cure in stuitering and stammentes of which I was a visitin. I secured the treatment of which I was a visitin. I secured the treatment at a normal rust and to my surprise, in just a few days, I was greatly toppersed. Today I talk clearly. Yours truly.

J. E. Bancom.

Mr. W. P. Chapman, of Whigham, Ga. wins the second prize for the following letter on the advertisement of the John Rahn of Chicago, III.

Dear Sies:

I have been interested in sign pointing for a long time, but the companies whose advertisements I answered failed to give astrologism.

I asswered the ad of John Rahn, Chicago, which was in the Popular Science and the results were opinistid. I now have a very profitable business to sign pointing. All advertisers in Popular Science are cellable.

Yours very truly.

W. P. Chapman.

The Third Prize goes to Edward Russell, Pittsburgh, Pa., for his letter on the advertisement of the Handy Dental Specialty Com-

The winners of the other seven prizes are: S. W. Stanbery, Winama, Idaha; Frank G. Davis, Harrisonburg, Va.; Soichi Nahagawa Keslin, Kanad, Hastaili Lella Livermore, Memphis, Tenn.; Surton Gilson, Scinston, Ont.; Mrs. T. H. Lynn, Hyattaville, Maryland; W. F. Sandmann, Indianopolis, Ind.

Rate 36 Cents a Word. A 10 discount in allowed on all contracts for six consecution insertions. Advertisements intended for the Oct. issue should be received by August 5th

#### BUSINESS OPPORTUNITIES

SOMETHING new in the Mail Order Husbans. Starts you in business right at home. No part time, or home to bused methods. Station A. Bac No. 6, Ban Diego, California. H. N. Allison.

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PATENTS procured: Trade Marks Registered—A recoprehensive, experienced, prompt service for the protestions and development of your ideal. Preliminary advice gladly furnished without charge. Bookiet of information and form for disclosing idea free on request Richard B. Owen, 44 Owen Bidg., Washington D. C., or 41-2 Park Row, New York.

SIGNS and Showcards easily painted with Letter Patierna Large variety of at lim and sizes. Sample for states. John Rahn, GHIB Greenview Ave., Chicago.

USED Correspondence courses of all schools sold, rented and cerlanged List free, (Courses bought.)
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TART small home Mail Order Society. Beolist

20. Harvey Teeple, Decatur, Indiana.

THE Great Wheat secret. New book showing the cause of wheat swings and how to forecast them. Unequalled method for trailers, speculature, skillers. Eye-opening folder free; write today. Market Poverance Co., Dept. 3. Box 174, Topeka, Kansas.

WE start you to business, furnishing everything; men and warmen, \$80.00 to \$100 fit weekly operating our "New System Specialty Candy Factories" anywhere. Opportunity lifetime; bounded free, W. Hillyer Rapidale, Drawer 12, Past Crange, N. J.

COLD, Silver, and colored Sign Leiters for windows, entermables, trucks blake them yourself with our Process and Letter Patterns. Fast scheen hig profits. No experience, stamp brings actual sample. Witherdist, 1144 Pleasant Street, Oak Park, Illinois.

ARE you old at forty? Res our advertisement on page 117 of this issue. The Electro Thormal Company, 4048 Main Street, Steubenville, Ohio

LEARN now to solder all kinds of metals, rend address of three Prends for the control of metals, rend for the and address of three Prends for the converges to and address of three Prends for the converges hook.

Twenty Years of soldering I specience. Timber, Box 1134 Sections, Nebraska.

IMPORT your own goods. Big Corners expert maga-cine published in English offers thousands of bargains in latest poveities. Sample copy for. Opportunity for obtaining predicable assesses. L. Abou Specially Co., 163 Fifth Ave. New York City.

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SUCCESID With Your Own Products Farmulas Processes. Trads-Secrets. Madern mater methods. Catalog from, C. Thanky Co., Washington, D. C.

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DSSTRICT mleman for union made, hard fallo, ed, all wool cults and overcoats at \$21.50. Prefer married man, with sales experience. \$35.00 weekly to start. Apply D. N. Harvey, Box 00, Chicago.

More Money Making Opportunities on pages 8 to 15

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August, 1915

## Are <u>You</u> Really Well Informed?

## Test Yourself with this Famous Questionnaire!

EVERYBODY is talking about the famous "Popular Science Questionnaire." In the panel is the list of questions of which the Questionnaire is composed. How many of them can you answer?

These questions were prepared, after a great deal of thought, by a group of eminent scientists. Their test has become famous throughout the country asthe "Popular Science Questionnaire."

### Like an Old-fashioned Examination

May we ask you to make this test carefully, reading the questions slowly and giving thought to each one? When you cannot answer one satisfactorily to yourself, put a zero (0) beside it.

On the other hand, give yourself credit of four (4) for each satisfactory answer. Then when you are through, see how near you have come to making a mark of 100.

This is like an old-fashioned examination, but you will find it fascinating. The questions all have to do with the wonders of the world we live in. All can be given quick and straightforward answers by any person of education.

All of the questions in the famous "Popular Science Questionnaire" and many hundreds of others, have now been answered, for the first time, in one book—The Pocket Guide to Science.

Into this cone brilliant break of 284 pages has been constanding facts about the world we live in.

All that you probably ever will want to know about science is told in this one 284-page book that will fit in your pocket or grace a library table. Curiosity-satisfying facts about the world welive in are made instantly available to you in simple question-and-answer form in The Pocket Guide to Science.

You are assured of the accuracy of the answers in THE POCKET Gume to Science because it has been edited by Dr. E. E. Free, who has remarkable genius for condensing the known facts about scientific questions into easily remembered paragraphs.

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#### POPULAR SCIENCE MONTHLY 250 Fourth Avenue, New York

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## POPULAR SCIENCE QUESTIONNAIRE

#### Test Yourself Now

- I. Why does radium continue en give out beet for thousands of years?
- 2. Are the state solid like the
- 3. How was the earth formed?
- 4. Why is glass transparent?...
- 5. How do we know that the earth is slowly shrinking?
- 6. What is an electric current!
- 7. How was percoleum formed?
- B. Do electrons really move through wite when an electric current is flowing through it.
- 9. What physical changes in your body are produced by fear?
- 10. How do muscles enert power?
- 11. What ore X-rays?...
- 12. Can we see aroma with a microscope?
- 13. Why does heat expand things and cold contract them?
- Why does the moon appear to charge its shape from time to time!
- 15. What is the brain made of
- 16. Why is it possible that the inside of the earth is growing botter instead of colder?
- Why is frust more likely on a clear night than on a cloudy one?
- 18. Does thinking use up the thinker's energy?
- 19. Which travels faster, electricity or light?
- 2). What simple test will distinguish wool from corren."

  21. What makes the noise of thum-
- 22. Why would men ultimately sufficient if all the green plants
- were killed?

  23. Does the boiling of water remove the impurious in it?
- How do the living cells of the body get the energy with which to do their work!
- 25. How is the spend of light mea-

TOTAL PERCENTAGE.



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N year'er surning a cent has thus less to a seek for the subset of the food of

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See Page 17.

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23 00. Klota, 937 North Ninth, Reading, Pa.

Mare Money Making Opportunities on pages 6 to 15

#### Money Making Opportunities

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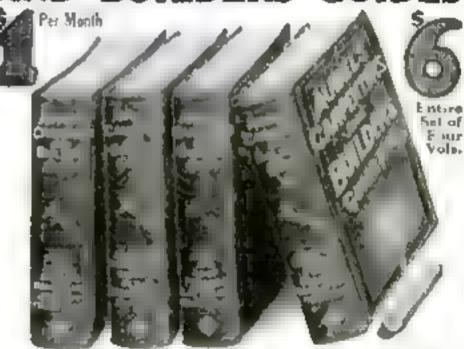
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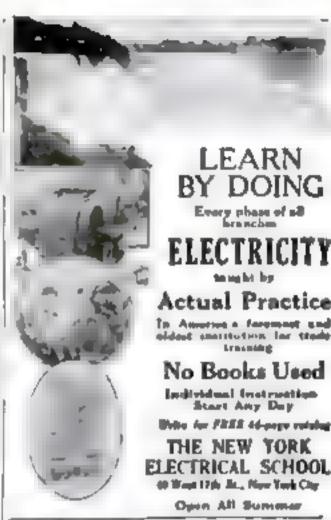
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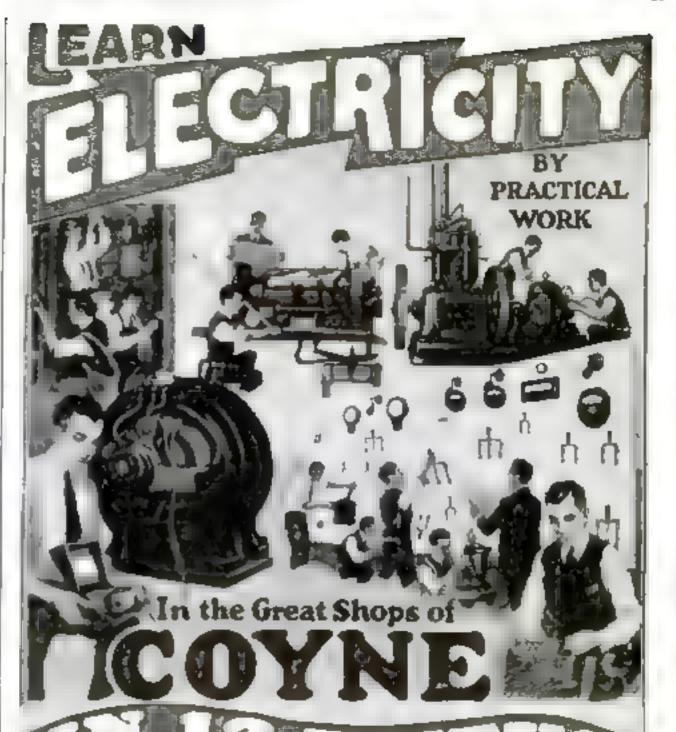
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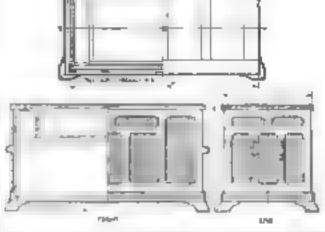
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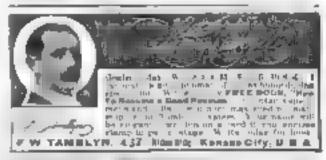
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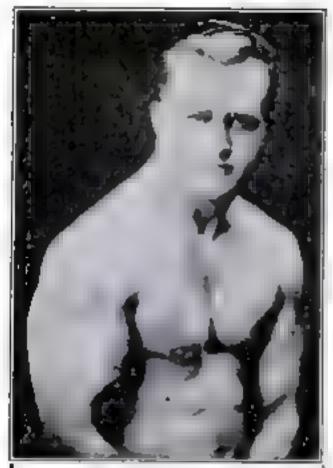


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Easy to Learn at Home

The his makes Builto mer use American largest and shired of one hoody bades beliefly will train you a some in your state that the test after a few hard bracks in the face of you wish to locate



N. R. I Man Land Bir John Letters from ou anddebte dove

#### Makes \$50 to \$80 a Wook Mora

Further about then that the z ments to the term of the

#### Increases Pay 160%

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SPECIAL OFFER-ACT QUICK

The congrue before he age you be used America Book on Rasis ove and on I tells you how to turn a cast me to a tested Mine. There are We have a special I metal. But of those who act Quick y Must the suggest MCW.

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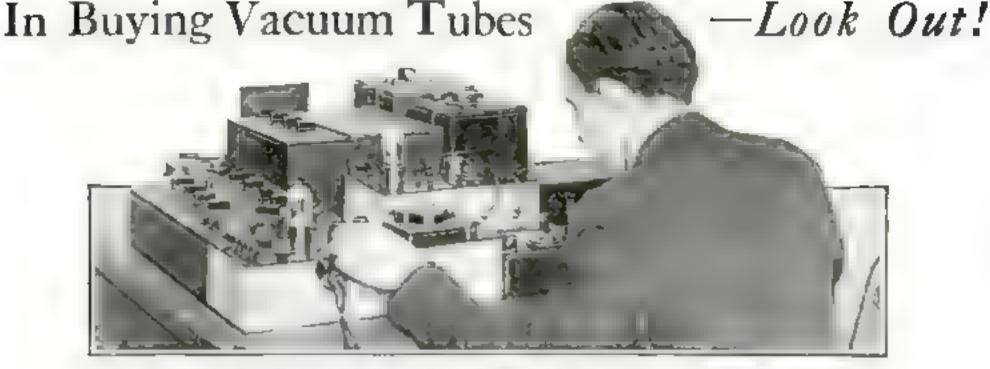


VATIONAL RADIO INSTITUTE Dopt IXEB, Washington, D. C.

Theare send me addition the elightest obligation your fire Bank. But Rewards a Radio and full in set of your species Free Employment Service. Theart write planets.

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Alexander Sensulus. Radio Engineer of the Popular Science Institute of Standards is shown here testing vacuum tubes on the apparatus used by the institute. The headge arrangement shows the internal capacity of every vacuum tube tested

#### By Alexander Senauke, M. E., E. E.

Radio Engineer Popular Science Institute of Standards

HERE is, probably, no other radio product on the market that can hide its merits or demerits quite so thoroughly as a varuum tube.

Every vacuum tube looks like every other vacuum tube, but, unfortunately or perhaps fortunately -they all do not perform alike. In the case of some radio products there are points of construction, etc., for which the purchaser can look, but in vacuum tubes there is no distinguishing feature that will give a clue to the efficiency of the product. As a result, the inexperienced purchaser of radio products is quite likely to be misted by price.

There are a number of tubes being sold to-day whose price compares favorably with standard tubes, but whose efficiency is not at all comparable. Noting the similarity in appearance, the purchaser who has not suffered already by experience very likely will attribute the difference in price to the cost of a "big name " He buys the unknown tubes

once-but not twice.

BEFORE any vacuum tube (or other radio or tool product) can be advertised in Popular Science MONTHLY, it must go through a very rigid test in the inboratories of the Popular Science Institute of Standards. There, experts determine whether the tube will give satisfactory service and whether that service will last over a reasonable period of time.

The characteristics desired in tubes

- High amplification constant.
- Low output Impedance. Low internal capacity.

ular Science Monthly may expe

THE PUBLISHERS.

4. Correct ratings of filament, voltage and current.

5. Filament emission that will be little affected by ordinary use.

6. Mechanical construction that will insure against (a) Excess of microphonic disturbances; (b) shortening the life of the tube by ordinary use.

The laboratory tests are based on these requirements. First, the tubes are inspected for construction and finish. The parts are measured in order to determine whether they fit the socketa, ste. Following this the manufacturers' ratings as to filement current and plate voltage are

The Engineers of the Institute next measure the voltage amplification constant, the output impedance, the internal capacity, and the total filement emission.

Where special design makes it necessary, sufficient additional laboratory measurements are made, so that an analysis of all measured constants will permit of determining the suitability of the vacuum tubes for their intended application.

The effect of normal abuse on filement emission is measured. The tube is paralyzed purposely also, and the effectiveness of the recommended methods of restoration on the particular tube is checked. Actual use of the tubes in their various espacities in different radio receiving sets makes a final check.

The purchaser of radio vacuum tubes has, then, one point to go by in judging the products offered to him. If the tubes bear the seal of approval of the Popular Science Institute of Standards they will give good service service that has been determined accurately by the tests described above.

T IS obviously impractical for even as completely organized a bureau us the Institute of Standards to test all products listed in tool or radio estalogues advertised in our columns. Only tool and radio products specifically advertised in Poru-LAR SCIENCE MONTHLY are tested and approved by the Institute.

#### Send for List of Approved Products

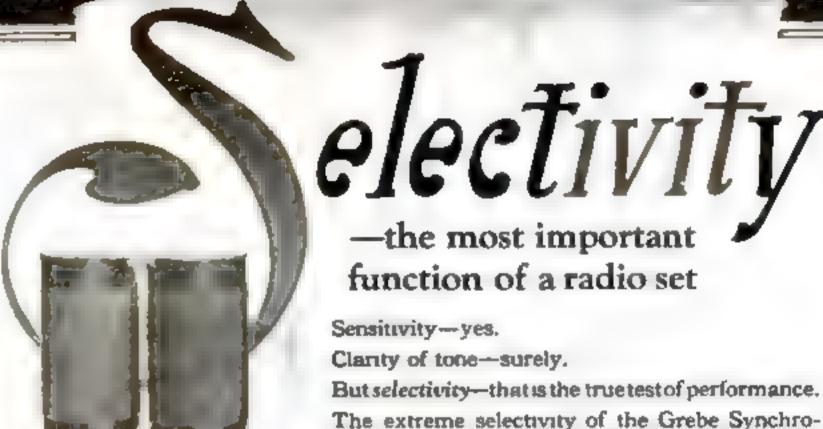
POPULAR SCIENCE MONTHLY WILL be glad to furnish on request a list of Radio and Tool Manufacturers whose products have been approved by the Institute.

## POPULAR SCIENCE Monthly **Buarantee**

The above seal on an advertisement indicates that the products referred to have been approved after test by the Popular Science Institute of Standards.

Popular Science Monthly guarantees every article of merchandise advertised in its columns. Readers who buy products advertised in Popthat these products will give absolute satisfaction under normal and proper use. Our readers in buying these products are guaranteed thin eatisfaction by Popular Science Monthly.





Binocular Coile

But selectivity—that is the true test of performance.

The extreme selectivity of the Grebe Synchrophase has been made possible by the Binocular Coils which, because they have no field, are unaffected by impulses from undesired stations. They keep the set automatically balanced against such, interference.

These Binocular Coils are exclusively Grebe, as ere also the

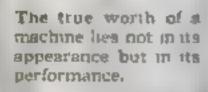
Grebe S-L-F (straight line frequency) Condensers and Grebe Volume Control which are outstanding features of the Synchrophase.

> Ask your dealer to demonstrate these features or write us

A.H. Grebe & Co., Inc., Van Wyck Blyd., Richmond Hill, N.Y. Western Branch: 443 So. San Pedro St., Los Angeles. Cal

> This Company owns and operates stations WAHG, WBOQ; also mobile and marine lowwave re-broadcasting stations.





- Locker

A I Grebe appear rattis is univered. by parents grent. ed and parding

Also supplied with base for batteries



## POPULAR SCIENCE MONTHLY

SUMNER N. BLOSSOM, Editor

August, 1925





IGH above the waters of the Baltic Sea recently a semplane soured. Suddenly it dived, straightened out within a few feet of the water. and soon was skimming the waves. Observers watched the maneuver with interest that changed to astonishment when they asw two sails rise and spread their white canvas on the hull of the now heating airplane. The sound of powerful lengines was reduced by half; evidently only one was running. Then that too was all enced, and the plane scudded through the water, with a snappy breeze behind the talk, as smoothly as any sailboat though with less grace, owing to the appearance presented by the two great orgines raused above the hull of the plane and the widespread wings with their upward slant

This astonishing new type of all-metal flying sailboat pictured here and on the cover of this issue, was completed and tested a few weeks ago by the Rohrbach Metal Acroplane Company of Copenhagen
It is constructed of duralumin and built
on principles used in bridge and shipbuilding work, that is, of riveted girden
and plates. This structure permits of
larger wing spans and the use of more
powerful engines. But the roa feature
the stobrbach seamane is the ability in
carries and, a majorail, forestil, and ju
There sails are rollapaible and may be
pread to the wind or collapsed at will
They serve a auxiliaries to the arplace engines providing at added ex-

they serve a auriharied to the arplace engines, providing at added enment of safety on long cruises. Should out engine fail, the other would still keep the plane going; but should both engines fait the salls would carry the bost along until the engines had been repaired or until help arrived.

Again, should a tempest drive the plane far from its appointed course, and the fuel supply run low—the sails could be resorted to and the fuel supply conserved, These filustrations give a general idea of the design of the Rohrbach plane. It is of the monoplane type, with cantilever wings set at an unusually acute angle, which is said to aid materially in the machine's control. The wings are so strong that the crew can walk safely along them, a feature that is of considerable value in docking. There are two auxiliary stabilizing pontoons situated under the wings, as well as a beaching trolley.

The bull itself is divided into watertight compartments by bulkheads and is designed so that the machine will float with any two compartments flooded. The two great 12-cylinder engines are mounted above the hull on hollow metal struts that carry the motors and propellers clear of the wing structure. They will develop a speed of 1800 revolutions a minute, furnishing approximately 720 brake horsepower. This newest seaplane marks a distinct new departure in aeronautics.

# Factory-Made "Vegetables" Our Future Food?

Nature's Processes Duplicated by Noted French Scientist in Amazing Experiments

By Norman C. McLoud



Discovers Secrets of Plant Life

Dunie, Berthelot, world-famous stientist using the mercury-vapor quiets lamp, which he predicts may eventually supposed the plowshers. He has proved that the common gases of the sir when subjected to altra-violet light from this tamp combine to produce the principal august, duplicating nature a processes in growing plants. In his experiments his eyes are protected from the blinding says by black mechanics

HY plant vegetables and till the anil when we can build factories that will actually fabricate our feedstuffs?

instead of hauling produce and in the continent, why not manufact the from

its chemical constituents in the beart of the great cities in which it is t

The idea may seem fartastic, but the thing is an accomplished fact. I have seen such a factory in operation. I have talked with the man who made it pussible. He is Daniel Berthelot, one of the world's most distinguished seems.

Lists. In his laboratory at Meudon, near Paris, Profemor Berthelot already has produced foodstuffs artificially by subject 12 various gases to the fluence of ultra-violet light His products have been amellinguantity, of course yet it is because of the surcess of these amazing experiments that he was a to depict for me in an one ture.y convincing way, foot factories of the future that may take the place, in a arge measure, of our farms

Here is how Professor Berthelot describes has astounding schievement of duplicating in an amazingly simple way processes of nature that was men for conturies have considered entirely beyond the power of man to fathom—processes of nature, by the way, which are connected closely with the greatest of all secrets—the creation of life itself.

Bear in mind, always that these are the words of a practical man of science, long famous throughout the world for his scientific achievements, especially in the use of ultra-violet light.

"I see the factory in operation," he trid my. "Each unit will be a large room with a low ceiling. The floor will be ocounced by glass tanks of great capacity. Each tank will have then pipes for the introduction of pines—the same gases that nature utilizes in the production

vegetable foods. Entering at the top, these gases will flew downward, and across the table. Sieses and a method will be converted flood of energy, and across will be converted.

into vegetable material while we watch

"The process will be dramatic. Through the glass walls of the tank we shall see something in the nature of a gentle anowfall that will accumulate on the floor of the tank in the form of powder that constitutes our finished product—vegetable starches and vegetable sugars created in faithful reproduction of the works of nature.

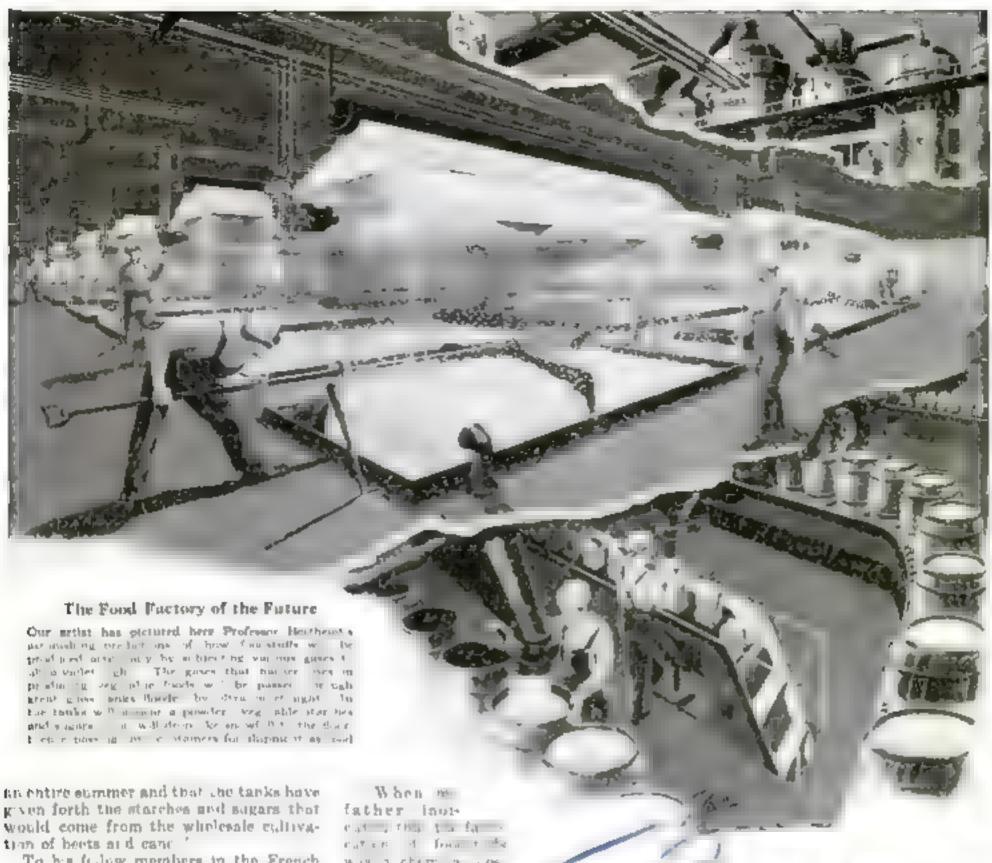
"WE SHALL see workmen in overalls, their arms and faces yellowish green under the powerful glare of the lamps. Each man will wear a pair of goggles, without which he would go bited quickly

"We shall see the workers using scoops to gather the harvest. While we watch they will be filling barrels or boxes with starch and sugar—the starch from one set of tanks and the sugar from another. If we follow these containers to the shipping platform, we shall see them loaded on trucks or railway cars and sent out to the world's markets. The records will show that the day's output has been equivalent to the yield of a large farm for



Berthelot's Garden of Wonders-A Shrine of Research

Here Professor Berthelot is seen in his remarkable garden studying the part played by insulation and humidity in plant development. The justile contains water that is carried through tubes to the soil in the vitraous containers



To he follow members in the French Academy of Sciences, Daniel Bertbelot's theregyeries are as fame, at as those of the Curies or the epoch-making and every new of Pasteur His laboratory is the of the shrines of modern resparch, and he labore have brought him membership in the French Institute, the presidency of the French Society of Electrical Engineers, and the chair of professor in the world-Inmous Sorbonne of Paris

was a chare a yes

on ty bertlefut old my chargarten at Meuden, Sports of his conferencement les tempted to revard the idea a silly Today the altha violet ray had made the prosed fronk a matter of tangible fact rese rays have given us a process of mirable theoretical simplicity, closely skin to the methods of Mother Nature herself. In keeping with natural forces,

we realize the composition of vegetable

March 1 1 Mile and E We hade proceeded on the basis that in the same of sunshine it is the right ----with the heat that produces the growth in plants

"The breathing of an animal or a human being embodies actual combustion and uses up the oxygen of the atmosphere. In this combustion, the hydrogen and carbon in the body of the animal that are combined in various organic forms are reduced to carbonic acid and water vapor. Growing plents produce exactly opposite results. Under the influence of the sun, the plant takes the two gases exhaled by animals and combines them again to form the sugars and the other hydrocarbons that are foodstuffs of human beings and herbivorous animals.

"Until recently this synthetic function of green plants has not been reproduced in our laboratories. Therefore, many scientists have considered the function an essential and excusive property of life itself. I have been able to prove otherwise. Right here in my laboratory I have demonstrated that the old theory is wrong. In other words, the changes produced by a growing plant are not the result of vital action, but arise from purely physicochemical reactions.

#### How Rays Affect Plant Growth

By expaning the test tubes, controling pietet weeds to ultraviolet light at vacying intensities and for varying periods Professor Berthelot proved that plant mort eserne diworg purely physico-chemical reactions. In the four tubes A the needs were killed by exposure: in tubes B the scale were retarded. while in tabes C the ereds give normally

(Custinued on page 100,



#### Hauling in the Loaded Nets

Science has a me to the an of the the main's of their work of their being every your fishing for herring the forement considered that her mechanic herease the eatch. As a temporal that herring a hoole in waters. North America and Europe of we amader on he had been more and the British Coverage at the British overage at the acute of page of the sent of the page of the page of the sent of the page of

### Plane Villa Fishermen

An airplane and to locate who also of bah. When the discover again the first and the nets are spread from the hard from glaces fleets of every country new use planes.



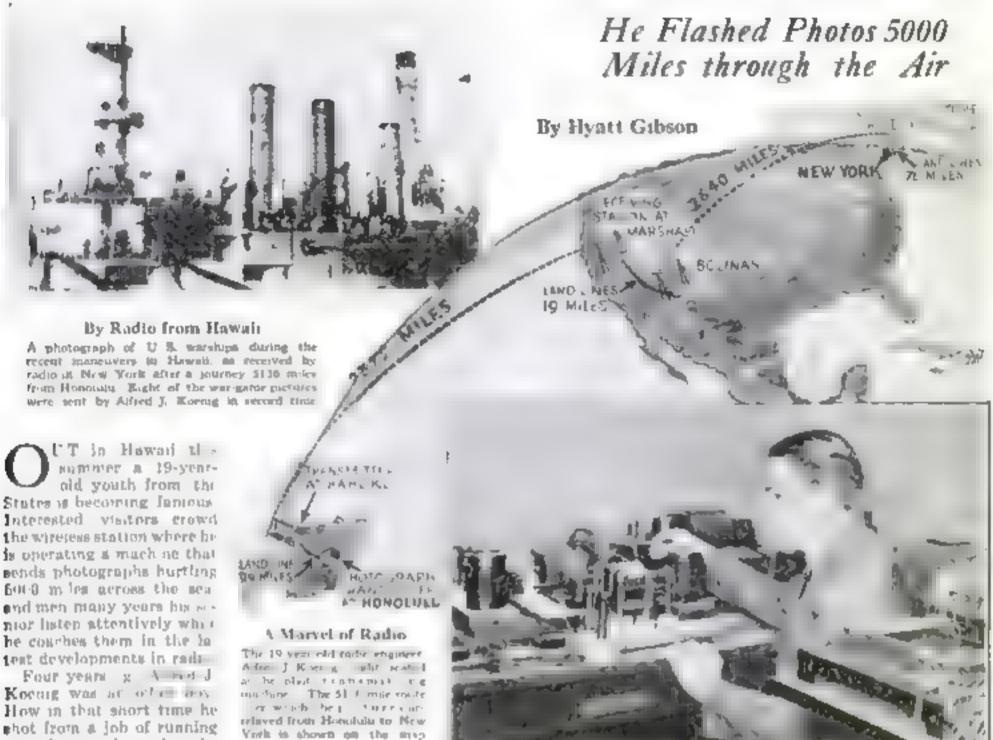
In Northern Waters Conditions such as the above are every lay expenses as to the horring fathernich at winter waters. Frizen special has expense the vessel its rigging and the fishing nets with a reasy and langerous sheart disc

#### Setting the Nets

Above Blowing op the blackers that are attached to the nets to keep them aftend At right. How the fleet operates. After receiving the plane's agnal the boats, called 'drifters," spread the nets, sometimes a quile or more long, held up by painted bladders. The mesh of the net is just large enough to admit the head of a herring. When a fish tries to withdraw its gills prevent its escape



## This Boy Made Radio History



Keenig was at other one How in that short time he shot from a job of running errands to a place where he was intrusted with one of

the most important experiments undertaken by a great radio corporation, is a regular story-book tale, more interesting because it is true.

Like thousands of other boys, young Koenig was enthusiastic about radio He rigged up a radio etation at his home in Brooklyn, N. Y., and joined the Amateur Radio Relay League.

In the daytime he went to preparatory, school, but every evening found him a the Marconi Institute studying radio When he was only 15, he passed the test

for first-grade commercial operator.
The name "Radio Corporation of America" had a fascination for him and he got a job in the offices. Profing etters wasn't very exciting work, but he liked to be where people were tarking radio. He kept on at night school, studying electrical engineering.

Captain Richard H. Ranger, of the Engineering Department, had noticed him in the office. Alfred Koenig was quick and eager. Captain Ranger got him transferred to the Engineering Department and set him to work doing mimeographing Gradually he was allowed to do engineering work. The engineers were developing amplifiers with particular reference to relay work.

When the method of sending pictures by radio, invented by Captain Ranger,

was developed, Alfred Koenig was in on the ground floor. He had helped work the system out. The day when the first photographs were transmitted successfully from New York to London, was on of the most thrilling be had experienced

HEN the corporation decided make a second test muc more te Photover than the transatiantic on gothe should be sent from Hawall to miles. Some one -a pectalist would have to be at the sending end who knew a labout the special transmitting apparatus, who could set it up and repair it if something went wrong. He would have to know, too, how to link several relay

"We'll send Alfred Koenig; he can handle the job," decided the officials, and sent him off to Honolulu with a photographer and the picture-transmitting ap-

The young expert met all expectations. He stopped in San Francisco and made the relay connection between the radio telegraph system, from Hawaii to San Francisco and the one from San Francisco to New York. After completing the system in Hawaii, he spent a day testing the relays. On the second day, photographs of the army and navy maneuvers at Honglulu were sent to New York in record Frenking time a set of eight pictures in less than 20 minutes!

hotographs of the war games were layed by wire and wireless over 5136 miles They traveled 5012 miles by air in two wireless jumps, and the remaining 124 miles over telegraph relay wires Since the test pictures were sent, photographs have been transmitted regularly over this great distance. The process takes from 10 to 20 minutes.

DHOTORADIOGRAMS, or wireless pictures, are believed to hold forth tremendous possibilities, especially in the field of military communication. A photograph of a message can be sent by wireless much more quickly than the message can be transmitted by changing words to symbols. By alightly altering the position of the carriage receiving a photograph sent by wireless, a garbled mass of dots and dashes travels through the air, totally unintelligible without a code.

Alfred Koenig will return to New York as soon as he has taught operators in Hawaii how to operate the photographtransmission attachment. He will go back to the engineering laboratory and keep

on at night school.

"You have to study like a house-afire," he explains, "to keep up with radio."

## Manless Monsters to



Shoots 23 Miles

The fit of property long results give a specific test for the 1 S. Arms v. 17 will be required at specific sec. 2.5 miles

Where g and war highes in notice or two. The question of the form on a strict New York Copy and there against account of the how pure full see one of break to guest of cets but one contract guilts.

Huge Modern Weapon, May Be Dwarfed by Appallingly Destructive Machines





Two of Uncle Same's acaptanes hiding behind a thick smoke acreen taid down by other planes at Bay Shore. Md A seven hundreds of feet high and as impenetrable to human eyes as a brick wall, can be laid down by an airplane at the rate of a mile a minute by a new method developed by the U.S. Chemical Warfare Service. This means of contradicant, it is believed, would be of tramendous sid to attacking planes during a navel cognegation.

#### By Truman Stevens

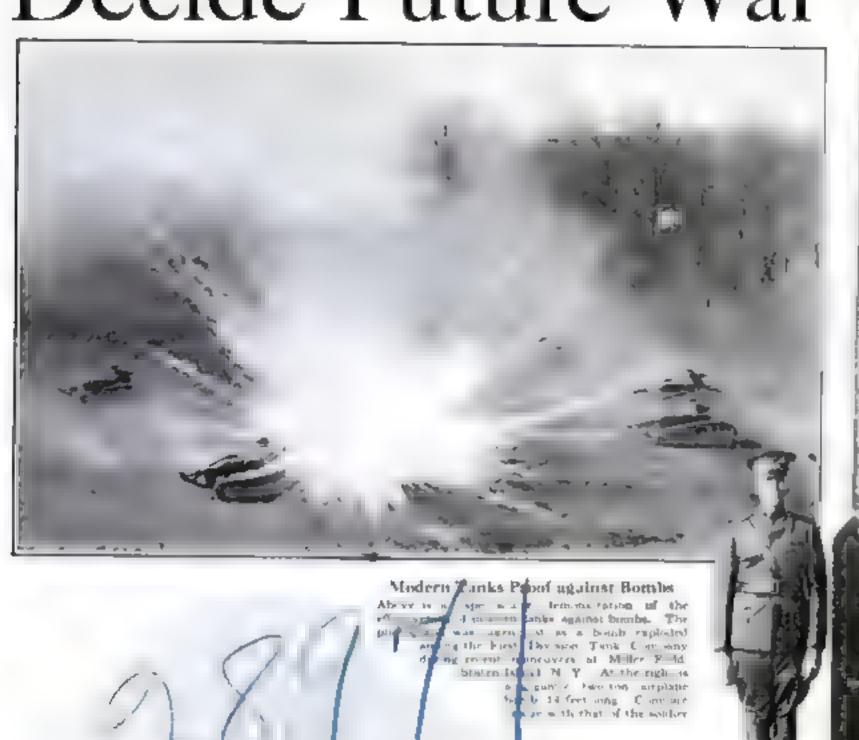
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native the place of material repairs and attenuants practice are transposed to be a superior and a superior and a superior and a superior continued to the superior and a s

the was has rawn as a per reoffice has catastrophes. Professor A Millow of Lancon internationary known sainted as a section to the Project War Investors by Language Carring to the War.

The to man also of three war as it sees the last the sea the ladersea, and the air. These monstrous engines are the each to hamas mode a lastrest break through and lestrey populated areas. Once the machines of either sile areas through with their deaday gases, chemicals, and explosives, the end will be only a matter of moments.

Radio control, radio communication,

Decide Future War



and mastery of electric power will be deciding factors. Among the predicted weapons are combined armored tack-

for highling on land under water, or in the air; jets of water hard I will enter ty to kill off all life with which they enter in contact headly gases and chemical; battle planes developing wire less power to destroy aircraft within neveral miles, wireless fire to devastate enemy territory, wireless control of torpedoes, planes, ships, and submarines

"The possibilities of electricity as a lethal weapon are almost unlimited," says Professor Low

"Men will fight not with their bodies but with their minds. Their ingenuity will be directed toward supplying themselves with long-range weapons, responsive to exact control and capacite of keeping at buy the lethal engines of the enemy equipped with facilities for the destruction of whose nations at a single blow."



How crees were crumpled like arraws before the ondought of tanks in recent mimic worker at Miller Field, States Island. There 15 great tanks rumbled irresistably over stone walls, trees, and disches. This picture gives an idea of the tanks great power

## A New Speed Rival of Plane and Auto



PRECISELY at eight manutes have fore seven the other morning to first section of the famous Twentieth Century Limited, one of the fastest trains in the world, rumbled across the New York Central Bridge at Albany, N. Y., for its daily trip down the Hudson River shore to New York City.

One minute later two high-powered motor-boats, the Baby Gar IV and the Baby Gar IV and the Baby Gar V, flashed out from a float-almost directly beneath the bridge, and in furrows of flying apray, streaked down the river in pursuit.

The shades of Robert Fulton and of Henry Hudson must have stood aghast at the dramatic contest that followed On the shore a streamer of smoke marked the swift passage of the Twentieth Century over the rails, while out in the river long ribbons of foam streamed back in the wake of the little speed-boats as they leaped across the waters.

Baby Gar V had broken down at Poughkeepare the Baby Gar IV, with its owner Gar Wood at the holm, completed the 150-mile journey to New York, 18

ru.e. 24 markes shead of the express.
It made the rulin 2 hours, 46 minutes an overage of 45 5 miles an hour.
Some have said that it was no race at

Some have wind that it was no race at all that the I wentieth Century starting from A bany 49 minutes ahead of schedule was compelled to "loaf along" the river bound to a schedule of safe operation. However that may be, the fact remains that this encounter passes into history as an epoch-making event. For by showing that it can leave behind one of the fastest trains on the rails, the power-boat definitely has won a place beside the airplane and the automobile in an era of speed.

Yecht Club doch after beating the I wentieth Century Limited from Albany in New York. In the center is Gar Wood owner and pilot. At his right is Olin Johnson, mechanic and at his left Charles F Chapman, who acted as the official typelspeep.

Experts are predicting that the day is not far off when motor-boats will travel 100 miles an hour. The present world's record of 80 miles an hour is held by the Mass America 11, one of Gar Wood's boats. Two of his boats have approached a 90-mile speed unofficially. And now, with the 100-mile goal in prospect, he has announced that he experts to build a host with 2500 horsepower—one that literally will fly across the water

Another sportsman who is siming at the same goal is Alexander Johnson, a New York man, who now is building the Yankes Doodle, a speed-boat with four Liberty motors giving about 1800 horsepower.

A Country

Schoolmaster

Stirs the

World

S THIS issue of Popular Science MONTHLY is published, there is scheduled to take place in the littie county seat of Dayton, Tenn., one of the most remarkable trials in the legal history of the last several conturies John T. Scopes, teacher and football coach of the Rhee County High School in Dayton, is being prosecuted on a charge of teaching the theory of evolution in deflance of a state law, enacted last apring. which forbids any instructor in the public school system of Tennessee to "teach any theory that denies the story of Divine Creation of man as taught in the Bible, and to teach instead that man has descended from a lower order of animals."

The apecific charge against Scopes is that in reviewing in the classroom a textbook on biology—a book, by the way. regularly adopted and used in the schools of the state-certain portions were discussed by him in a manner that indicated his belief in the theory of evolution.

Scopes was arrested on complaint of George W. Rappleyea, an engineer of Dayton, himself said to be supporter of evolution and friendly to the teacher. The complainant's reason for causing the arrest and subsequent indictment of Scopes probably is made plain by the fact that before he acted he obtained from the American Civil Liberties Union assurance of financial backing in defense of Scopes, both in his trial in Rhea County and in the event the case is carried to higher courts.

THIS is the first time since the theory of evolution was promulgated by

Charles Darwin 65 years ago, that the theory ever has served as the basis for a court case Moreover, we must bark back for centuries before we find another case in which, as in the present one, the principal point of imme is a conflict between religious teaching and

scientific opinion.

These are the circumstances that make the Scones trial remarkable, that have focused the eyes of the world on an obscure little Southern town of 1800 inhabitants; these, and the fact that in the prosecution and defense are marshaled an array of legal talent and scientific experts such as might appear in the trial of a capital case involving persons of international notoriety.



The Storm Center

John T Scopes, the young country schoolmaster of Dayton Tran who goes on try charged with teaching avolution in the Daylon high school in defiance of a state law of the aution's most noted lawyers (ac)bding Clarence Durrow and Buichridge Colby form-or Secretary of State have gone to be defend

For example, in addition to Judge Randolph Netl, of Kneefille, Tenn., who is in charge of Scopes' defense, there are appearing for the defendant teacher, Clasence Darrow, one of the country's most noted lawyers, and Bainbridge Colby, lormen Secretary of State and law partner of Woodrow Wilson Also, behind Scotes, ready to offer expert testimony in his behalf, is the entire membership of the American Association for the Advancement of Science, pledged h his support by Professor Michael [. Pupin, of Columbia University, president of the organizaton.

### What the Tennessee Law Says

LIERE is the main text of the law under which evolution in the high school of Dayton, Tennessee

SECTION 1 Be It Enacted by the General Assembly of the State of Tennessee, That it shall be unlawful for any teacher in any of the universities, normals, and all other public schools of the state which are supported in whole or in port by the public school funds of the state, to teach any theory that denses the story of the Divine Creation of man as taught in the Bible, and to teach instead that man has descended from a lower order of

SECTION 2. Be It Further Busched, That any teacher found guilty of the violation of this act, shall be guilty of a mudementor and upon conviction shall be fined not less than one hundred (\$100) dollars nor more than five hundred (\$500) dollars for each offense.

## Great Legal Battle Looms in Trial of John T. Scopes for Teaching Evolution

By Robert E. Martin

On the other side, arrayed with the prosecution, is William Jonnings Bryan, the country's best known antagonist of evolution.

Now, what is it that has enused these well-known men to enter actively into a legul case wherein a small-town schoolteacher has found himself in difficulties due to his alleged disobedience of a state achool statute? | What is it that has caused what, on the face of it would seem a matter of local interest only, to assume the proportions of a national issue?

According to Judge Neal, chief counsel for the defense, the question of the truth or faisits of the theory of evolution is not the usua at stake. The question to be decided, he declares, is whether freedom in teaching and learning what the great thinkers of the ages have worked out is to be maintained or denied. As such, he declares the principles involved in the Stupes the assume tremendous impor-Light co.

WULIAM JENNINGS BRYAN, on the other hand, maintains with the prosecution that It is the Darwinian theory that is on trial; that the question to be settled in whether the Bible or Darwin is to be accepted as truth in explaining the mystery of creation.

To many persons mention of the theory of evolution probably conveys no idea more definite than that the evolution wis hold that man is in some way or other descended from the monkeys.

As a matter of fact, no evolutionistnot even Darwin himsed—has held this opinion. The belief offered in 1844 by Darwin, Sir Charles Lyell, Alfred Russell Wallace, and several other British scientute, was that study of various biological, fossil, and other data, collected by them,

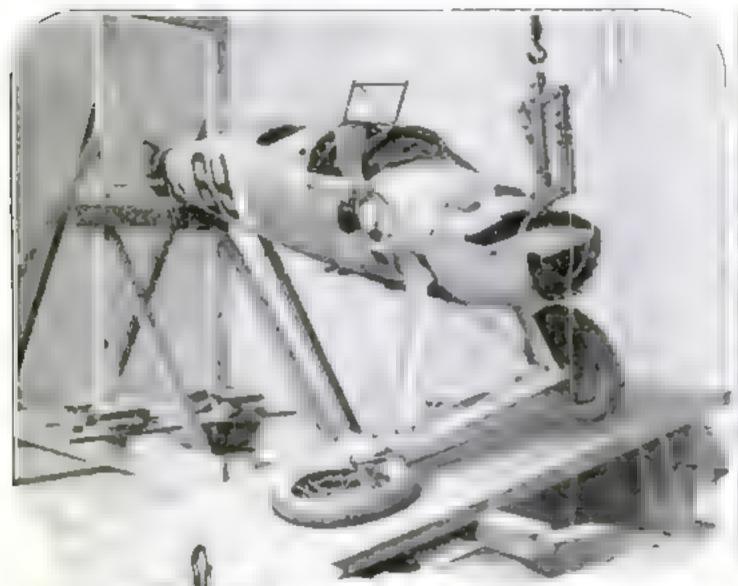
> indicated that reptiles were developed from fish, and birds from reptiles; that all nature develops in an orderly way, everything moving from a simple to a complex state.

> That is, instead of each of thousands of kinds of animals, insects, birds, fish, and reptiles being made separately, they came into being through gradual changes. In his book, "The Origin of Species," Darwin described a process he termed "natural selection," which might explain this development, pointing out how accidents, disease, starvation, and other factors weeded out the weak in every kind of plant and animal. Thus, only the fittest were left to produce new generations each year,

> > (Continued on gage 114)

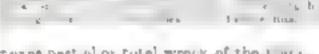
## When Airplane Landing-Gears Crash

Machines Dropped in New Safety Tests-By E. F. Bacon





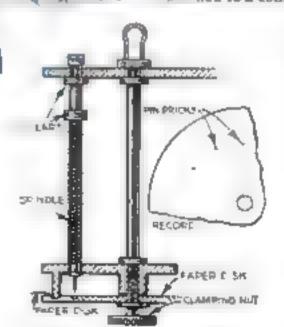




means partial or total wrock of the partial 4 2 4 44 7 D D 75 " stard up under various

fined is lifted vertieally by a block and chain until it reaches it is cropped suddenly on an inclined platform designed to simplate a cross-wind landing. In this manner the fuselage in dropped successively from increasing heights until failure occurs. The drop varies from 12 to 40 inches, according to the type of plane To determine accurately the live loads

at which failure oc-



Dugram showing construction of the shock-recorder. The position of pur pricks on a paper record registers the amount of sbock to the landing gear



Where the Break Came

Failure of the landing gear is seen clearly in these pictures of the test. In the second picture the fracture of a strut is veible. The second and third views show the rebound of the machine and collapse of the landing gear

and to obtain comparative data -k-algorbing systems, a shock-re-. instrument was designed. Thus mants of a pair of circular plates with through which a set of apindles, ited with needle points at their lower w is free to slide. The movement of Indicate governed by weights placed of the spindle and by an adjustable Suspring that fits loosely around it and and a section locked to the spindle

> Clamped to the lower plate is a circular recording paper. The record of a shock is made by small holes that are pricked in this paper by the points of the spindles as they plunge downward in response to an impact. Since, by varying the compressing of the spring, each spindle can be set to record a definite acceleration of gravity, location of the pin pricks on the record tell the story of the shock to which the landing gear is subjected and valuable data are obtained.

#### The Shock-Recorder

Shocks to which the landing gent is subjected are recorded by pin pricks made by a series of sliding spindies, governed by adjustable springs and weights, which are shown above

ITH the continued increase in flying speeds, and consequent increase in landing speeds, the problem of safety in landing is one that is engaging the best efforts of aeronautical

Safe landing depends not only on the skill of the pilot, but on the strength of the airplane's structure. Even the most expert pilot is unable to prevent rough landings under adverse conditions. A forced landing on rough ground, a sudden gust of wind at the moment of anding, or a quick swerve to avoid an obstacle, may cause violent stresses on the landing gear. Structural fadure under such conditions



Here for the three judges who will sward the prices in POPULAR SCIENCE MONTHLY'S \$15 000 "What a Wrung Contest, at work enamining entries. From left to right they are: Alexander Sensules. M.E., E.E.; Prof. Collins P. Bliss, and Dr. Hasen O. Tyler

## You Still Have Time to Win in Our Great \$10,000 Prize Contest

RE you observant? Are you slert? If you are, here is an opportunity to win one or more cash prizes in our \$10,000 "What's Wrong" picture contact. As you probably know, the contest was announced in our June lauve, but with 512 awards yet to be made, there is still a chance for everybody.

You can start now. The idea is simple It has to do with John and Mary Newly-

wed and their enthusiastic but inexperienced efforts to do odd jobs about the house. Eight pictures are published each month. Each shows something wrong in the way a job is being done, and in addition, the artist has drawn one thing in each picture incorrectly. What you are to do is to find the mistake the artist has made and also tell what John or Mary is doing wrong and why it is wrong

You wal find the contest fascinating and profitable. It costs nothing to anter. It is open to every one, everywhere. Members of your family and your friends all can take part in it. And you can submit as many sets of answers as you like. Remember, you have until July 30 to submit your answers for the pletures published in our July issue and until August 80 to solve this month's puzzles.

Take the first picture in the August contest on the next page, for example. There John is seen hanging a screen door. What is it that he is doing wrong? What error has the artist made? Study the picture carefully, then answer these questions briefly and clearly.

A number of contestants have written us asking whether they are allowed to send in more than one set of answers to any picture, and if so, how answers should be submitted page 110 of this issue, state that con-Monthly Contests or in the Grand Prize Contest, provided they are submitted in good faith. Additional answers for any

The rules of the contest, which appear on testante may submit as many answers as they wish for pictures in either the picture, however, should be sent in

## You May Win One or More of

These Big Prizes

POPULAR SCIENCE MONTHLY is awarding \$10,000 in 580 cash prizes for the best answers submitted in this great contest. The cash prizes in each of the four monthly contests are:

First Prize.									4	\$500
Second Priza										
Third Prize										
5 Prizes, \$10										
60 Prizes, \$!										-
Total, four	10	0	t	h	s			J		\$4000

In addition, cash prizes in the Grand Contest will be paid as follows:

First Grand Prize\$2500
Second Grand Prize \$1000
Third Grand Prize \$500
5 Grand Prizes, \$50 each \$250
50 Grand Prizes, \$10 each . \$500
250 Grand Prizes, \$5 each \$1250
Total Grand Prizes \$6000

as separate entries. In other words, you can submit as many different sets of answers for the pictures as you wish.

In cases where an individual submits more than one set of answers, the judges, in considering awards, will select the set of answers that is most nearly correct

The three judges who will decide on all awards are shown in the photograph at the top of this page. They are:

Prof. Collins P. Blass, Director of the Popular Science Institute of Standards and head of the Department of Mechanical Enganoering at New York Univererty, Dr. Hazen G. Tyler, Associate Director of the Popular Science Institute of Standards and Associate Professor in charge of Experimental Engineering, New York University; Alexander Senauke, M.E., E.E., Radio Engineer of the Popular Science Institute of Standards. The decisions of these judges will be final.

The third set of pictures, comprising this month's contest, appear on the two following pages. If you have misplaced your copies of the June and July ISSUES OF POPULAR SCIENCE MONTHLY containing the first two sets of pictures, copies of these usues may be examined free at the offices of this magazine or at public libraries. Or, if you wish, you may obtain copies at 25 cents each from the Picture Contest Editor, Popular Science Monthly, 250 Fourth Avenue, New York

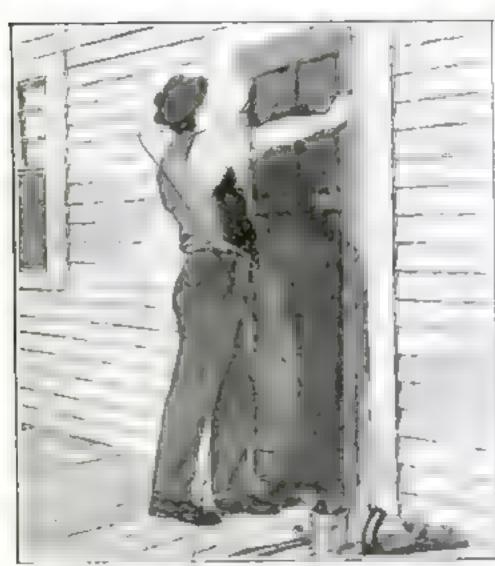
The fourth and final set of contest pictures will be published next month.. Watch for the Sep-tember number, on the newsstands August 10.

COMPLETE RULES FOR THIS SENSATIONAL "WHAT'S WRONG" CONTEST ON PAGE 110

# A \$10,000 Test of Observation and Alertness

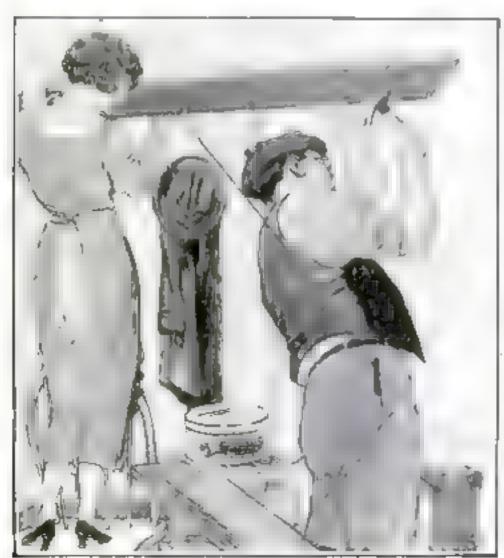
## What's Wrong in

In Each John Is Doing Something
Made One Error



1. When he is a single form off the house were to the Newl and single for the party of the party of the state 


2. Mary complains that the compression faucet in the weather is needed, and is delighted to try his hand at such a simple plumbing job



3. With Mary stendying the board, John finds double enjoyment in nailing up a shell in the bedroom closet, even though he is not quite sure how it should be done



A. New implement for the intchen floor arrives and John enthusiastically sets to work to key it. Here he is tacking down the first width, while Mary watches from the side lines

## These Pictures?

Wrong, and in Each the Artist Has in the Drawing

Read the Rules of This Amazing Contest—Page110



5. Mary superintends while John paints the drop-leaf table. When he finds the paint too thick to spread properly, he gladly adopts her suggestion for an easy way of thinning it.



6. One of the dining-room windows refuses to stay up. This gives John his first experience in removing the window stop and replacing a broken sesh cord with a new one



7 The engine of the Newlywed's coupé starts to miss—an excuse for John to tinker with the spark plugs. Here he is shown adjusting the points, using a helf dollar as a gage



8. Although a novice, John determines to repair some ugly breaks in the cellar floor. Here he is storing the cement behind the garage until he can find time for the job



Sky Nets to Capture
Planes

T. C C ST practices, forth one of the ratest and most spectacular developments in anti-aircraft defense. Devised by a Japanese inventor, Takeo Takagi, they now are being tested by the Japanese army and navy.

70 11 1 1 1 1 2 1 1 5 -

Fastened between parachutes, the

W T T T T F the paracheus option spreaming and nets in the path of enemy surplanes.

LF 1 174

Here our artist presents a dramatic picture of how the net is designed to foul the propeller lower picture shows a net on the ground with parachutes attached

# What's Wanted from Inventors

Here Is a Remarkable Record of Hundreds of Opportunities for Your Constructive Genius

By Clair Price

EMANDS of all sorts upon the ingenuity of inventors are contained in a red-bound memorandum book that lies in the members' room of a suite of offices in London, England, occupied by a patentees' mutual aid organization. Although it embodies an idea as unusual as it is useful, the book is as commonplace in its outer appearance as an ordinary ledger. Only the gilt tetters of its title, "What's Wanted," indicate to the casual

visitor that its contents are far from commonplace.

Manufacturers, ecleptists research workers, members of the British Parliament, housewives, and the plain man in the street have written their wante in it. London inventors have formed the habit of consulting it in search of ideas for commercially promising inventions. As a respect "What's Wanted" presents remarkable view of the wide scope of present-day inventive science, for the demanda made through this unique book vary from a method of utilizing atomic energy to such humble wants as an effective means of rooting up dandelious from the lawn.

IN SOME of these wants there are decades of work for laboratories with the most advanced and complete equipment.' In others, no more is needed than the flash of a new idea and a pair of ordinary, capable hands to carry them out. Some of them are far beyond the resources of the grange inventor. Others are anited to the humbler with of any of us, whether we are inventors or not. For the product of the man who can meet any of them there is a real demand, else they would not have found their way into the pages of "What's Wanted,"

There is money waiting for the inventor who can cope with any of these wants. In the case of a few of them—the harnessing of the sun's electromagnetic waves, for instance—there are milions awaiting the successful inventor and a position in history possibly greater than that of the man who first harnessed steam.

In the case of others—for matance, a pipe that can be cleaned easily and effectively—a comfortable little aum is waiting.

All of them, from the demands whose fulfilment would revolutionize industry down to the hum-

bler wants of the man in the street, may be found jumbled together in the crowded pages of "What's Wanted." If brevity is the soul of wit, there are few pages more



This is the most remerkable memorandum book in the world, its pages filled with needed inventions

under the heading of electricity and wireless. This is no doubt a correct reflection of our industrial civilization in this year of grace, 1926.

What Britain wants from her inventors is, first, improvements in the young science of wireless; second, domestic and general house-bold improvements in internal-combustion engines, new sources of power, and new methods of power transmission. To a lesser degree, the English people are interested in nautical, chemical, and phonetic improvements.

LASTLY, there are improvements wanted in the realms of the airplane, office methods, lighting, heating, and metallurgy. This, it might be emphasized, is the order in which England is making its demands upon the ingenuity of its inventors. A list of similar American wants might vary the order somewhat, for labor-eaving devices of the domestic and general household sort are more advanced in the United States than in England.

These, according to "What's Wanted," are some of the improvements that Great Britain is asking of her inventors in the realm of electricity and wireless:

A means of transmitting wireless power of sufficient capacity for transforming into mechanical energy,

An efficient method of varying radio oscillation frequencies over an almost unlimited range

A loudspeaker that is controllable without distortion.

Improved methods of electrical storage and power transmission. A loudspeaker free from the "phono-

graph affect."

What Would You Like 16 Have Invented?

OF N'T in strike you that the "What's Wanted" book described by Mr. Price on the article is a great idea?

That's just the way it strikes us. And so we are going to copy the idea. We are going to compile an American "What's Wanted" book

This book we will place on a table in the home of POPULAR SCIENCE MONTHLY at 250 Fourth Avenue, New York City. There it will remain always open for anybody to enter his wants in black and white. There, too, it will be open to inventors everywhere, who come to it for suggestion and inspiration.

If you live at a distance and have a want to enter, simply mail it and we will enter it for you.

Already we have a most interesting nucleus for our book; for on its first pages we are entering needed inventions suggested in letters from a number of interesting persons, among them Houdini, the world famous man of magic; George Gordon Battle, noted New York attorney, and Dr. David Starr Jordan, chancellor emeritus of Leland Stanford, Jr., University.

Can't you imagine the fascinating possibilities that such a volume holds? Any day—who knows?—an idea caught at random from its pages may lead to an invention which, like the steam-engine and the automobile, may transform the very world.

we live in. - THE EDITOR.

packed with wit, more abruptly eloquent, than the scribbled pages of this unique

If we attempt to straighten out its jumbled miscellany into some sort of order, to classify its hundreds of wants under general headings, it will be found that the largest number of them fall Elimination and control of atmospherics. Wire, ess te, evision.

More pelective methods of reception Elimination of voice distortion in wireless receivers, amplifiers, and telephones.

A receiving valve (vacuum tube), the effective anode-flament resistance of which is about 1000 ohms

CHARPLY directive reception Irom only one fixed direction with possibility of altering direction

Neutralization of internal capacity coupling inherent in triode VALVES.

More knowledge of the effects ard constitution of the heavy side ayer.

The true theory of crystal rectifiestion

A long-life dull emitter filament A different class of inventor will be interested in the domestic and general household wants that are spronked through the pages of \*What's Wanted ?



A Page of Entries

A pipe that can be cleaned easily,

A temperance drink that will keep and yet not pall on the palate

A means of removing old paint

Greatly simplified clothing, not strange in appearance.

A cheap house-warmer that can be

fitted by any one.

A plan by which house refuse can be easily and cheaply destroyed at home

COOKING range that is efficient, 1 e., that usefully applies a measonably large percentage of the heat of combustion of the fuel supplied

A fire grate giving the open fire effect without wasting the major part of the

fuel consumed.

An electric togeter that will if possible, cut off the current just before the twist begins to burn, or, if that is not possible, that will give some audible indication in time to avoid spoiling the toget

A tie presser and stretcher (or men's ties, which will take at least 26 ties at a

time.

A dandelion extractor

Under the heading of internal-combustion engines, new sources of power, and new methods of power transmission, there as work for the most brilliant and best egulpped inventors:

A motor engine of one pound weight par horsepower.

A light, efficient, alow-speed internalcombustion engine.

An internal-combustion turbine.

(a) Wind turbine electro plant. (δ) Water turbine electro plant. (c) Crudeoil engines for use in tractors and road

A method of reducing friction.

A practical method of making use of the power of the tides.

A CONTRACTOR ASSESSMENT

Laterates curering it to Harnessing the sun's electromagnetic-

Whyes. A method of utilizing atomic energy

Inventors of all degrees of achievement and equipment will find attractive ideas in a few of the other femands that are voiced in the pages of What's Wanted "

Means whereby a ship's officers can inform themselves of the position and movement of approaching ships and so avoid collisions.

improved ships' davits:

A safe method of stopping ships from rolling, or at may rate not more than a few degrees in the roughest weather

A process for thetantaneous color pho-

tography

A chimical thermostat that will operate as efficiently and permanently as the thermostat that keeps the human blood temperature at approximately 99° F. and the blood of other animals at various temperatures.

Refractory materials for lining steel melting furnaces and ladles that would be absolutely unattracted by erosion of the melten metal or corromon of the various metallic oxides formed during the steel meiting process.

A noiseless gun.

A motion-picture film that will speak, Non-resonant telephones.

A noneless zirplane.

An airplane that can be safely and

easily managed either by a boy or a girl. A method of conveying speech directly

and readably to paper

The discovery of the mechanism that enables us to remember almost instantly in our brains without going through the mechanism of the card index and equivalent systems.

A furnace that will conserve 95 per cent of heat

> A beat insulator, having as nearly as possible the strength of metal. which can be screwed and turned like metal and which, while insulating the heat of one from the other, will make a perfectly strong and rehable connection between two pieces of metal. The insulation must stand up to both dry and wet heat

> Motor headlight that satisfactorsly lights the road surface without "dazzung" approaching drivers.

Some form of lighting appliance

capable of penetrating fog A method of eliminating rust.

An alloy, ferrous or non-ferrous, possessing 50 per cent to 100 per cent higher tenacity than a known alloy without being brittle.

A glass that will bend

A mount of inducing and prevent-IPR TRUM.

More knowledge of the translation of mechanical power into musical tone.

Credit for first suggesting the usefulness of "What's Wanted" belongs to Sir William Bill, whose short, silver-haired figure has been one of the fixtures of the House of Commons for the last 25

Less than two weeks after Bir William's suggestion was made, the book freelf was placed in the mempers' room of the Institute of Patenters, "What's Wanted" then con-

Jamed a title page, Sir Waliam's preface, letter from H. G. Wells, and a list of 15 ants that its donor had montloned at the Institute's annual dinner. The rest or sta 200 pages were empty and waiting, but Ra donor's idea soon took hold.

Professor A. M. Low, a distinguished Stush acceptuat, was one of its earliest contributors and the list of 29 wants that he has committed to it is even now the longest single list it contains. Other contributors soon followed, most of them individuals, a few of them corporations. Thus far the British Broadcasting Company is the largest contributor among British corporations, and most of the wireless wants appear above "B.B.C."

THE mails began bringing in wants to be copied into it. Individuals began climbing the two flights of stairs at 44 Great Rumell Street, opposite the massive time-blackened front of the British Museum, to write their wants in it. Most of these persons are Londoners, but an increasing proportion are foreigners.

The Institute is a mutual association through which inventors supply themselves with technical, legal, and commercial advice in the development and marketing of their work, but "What's Wanted" is open to anybody, member or non-member, who knows of a specific demand worth an inventor's attention.

Astonishing Things an Expert Has Learned About

YOUR JEWELS

as told by

R. Clifford Black

to Newton Burke

OST New-Yorkers of the last quarter century remember the late "Diamond Jim" Brady, one of the most advertised men of his time. Newspapers and many periodicals had articles about his jewels and his love of the theater, and through them he was known throughout the United States. Literally ablaze with jewels, this eccentric business man set in the front row at every theatrical first night. He had 44 complete sets of jewelry, mostly diamonds. These included even diamond buttons for his underwear

The most unique of his jewels was what he caded his "transportation set." He used to wear this to rancoad directors' meetings. The pieces were of platinum studded with diamonds. The bulkt-studs were in the form of a bicycle, an alto, an airplane, and a buffalo, each 1 ½ inches long. His watch chain was made of interlocking wheels each set with marrieds. One cuff-link set was a diamond tank car and a coal car; a second set was a freight car and a passenger car, each two inches

His leather pocket-book was ornamented with enormous initials of diamond mermalds and dolphins. His eye-glass case was a huge locomotive set with diamonds. A big belt-buckle consisted of a wheel flanked by two tigers. The ornament of his finger ring was a wheel 1% inches in diameter. In the center was an enormous blue diamond which, although not one of the largest in existence, was one of the most valuable because of its beaut, (a) copier.



Peeling a Pearl to Expose Its Hidden Beauties

A pearl is formed in layers and when outer layers are poor in color or demaged, they may be posted off until a beautiful inner layer in revealed. Here is William Herriss, American pearl expert peeling a pearl, this Black, sponsor for this exacts, who is an international authority on jewels, points out that this is one of the most delicate tests in the world, since there is a chance of relating the pearl in the process. Only four men in the United States can do it successfully

His diamend the dasp warm the shape of a camel He used a leadmend of all platinum set with diamends. The watch had a which design set indiamonds he whole of the unique set weighed live pounds.

Dut "Diamond Jim," withinks pounds of jewelry, was a remarkable exception.

Most men care little for gems. Gave a men a watch and he is well satisfied. His sile can display the family jewels. Of the 1000,000,000, spent for gems by Americans yearly, about 95 per cent in for the adorament of women.

Women always have liked jewels. Did

Women always have liked jewels. Did you notice newspaper accounts of the excavation of Kish recently by the Fle.d Museum-Oxford University expedition in Mesopotemia? Kish was the colonsal Sumerian capital that flourished 3000 years before Christ, long before civilization in

Egypt. The Chicago excavators discovered a magnificent palace, and in the boudons of the court ladies were quantities of ornaments decorated with the same stones that we consider precious today.

JUST what causes people to at tach tremendous value to bits of stone is one of the mysteries of human nature. Money has changed during the centuries, but the value of jewels has remained fairly constant. In times of uncertainty fortunes are saved by converting money into jewels.

A dealer came to me two years ago and said, "Mr Black, I have a lot of emeralds here that I can sell cheaper than any one else." I asked him where he got the gents, and he told the following

During the war the gem miners in the Ural Mountains in Russia were unable to dispose of their jewels. A Russian emerald cutter foresaw the revolution that was coming and bought right and left of emeralds. He purchased a freight car, and had it fitted up with comforts. When the revolution started, he and his family began traveling in this freight car across Siberia.

He hollowed out a log that lay by the stove in his car and into this put all of his emeralds. As he was known to be a man of money, the Bolsheviks searched the car

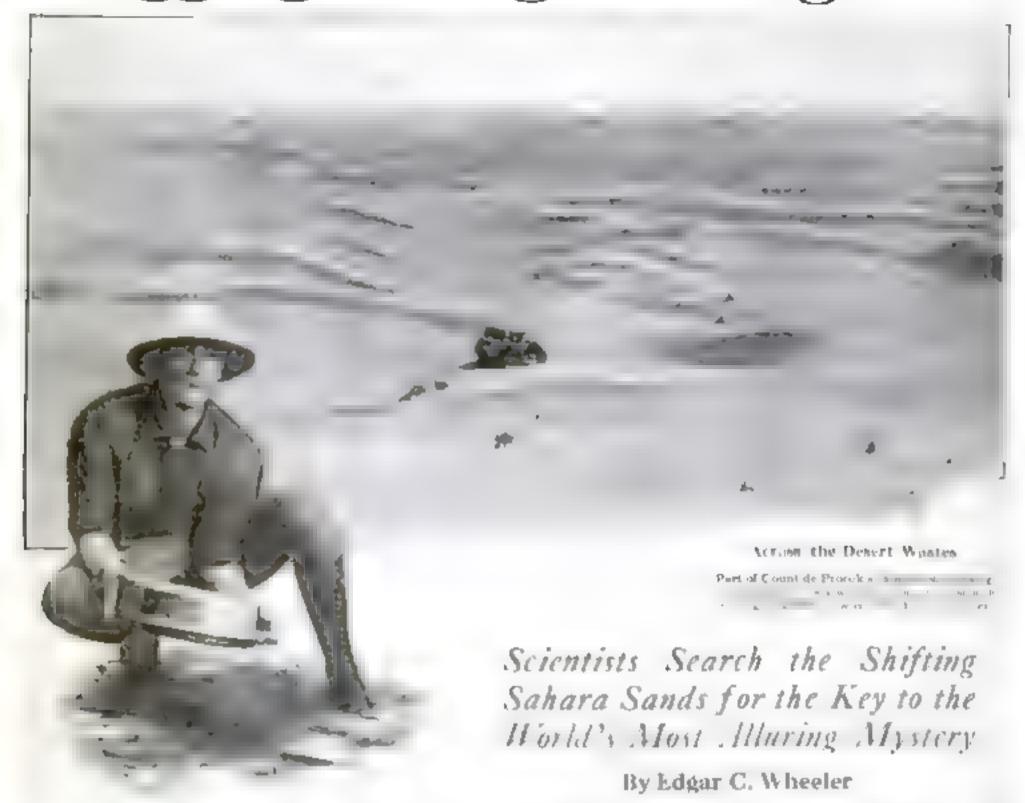
(Continued on page 112)



"Diamond Jim's" Remarkable Set of Jewels

Part of the amazing "transportation set" of jewels worn by "Diamond Jim" Brady. New York featorier, when he attended reliway directors' meetings. They are of platform studded with diamonds, and each piece represents none method of transportation.

# Digging through the Ages for



Sifting Traces of Prehistoric Mun

Count Byron Kuhn de Prorok leader of the Franco-American expedition in northern Africa sifting for prehistoric flints in the river bed of Oued El Abied. In the desert waster he seeks to uncover the buried remnants of a last continent

ROM long forgotten towns buried under the sands of the Sahara, and from other towns believed to have been submerged in the sea for untold ages, scientists today are at work to patch together bits of fascinating history which, they hope, may at last give an unswer to the world's greatest mystery—the legend of the Lost Continent of Atlantis.

Over trackless desert wastes of Tunis and Algiers, and along the Mistoric African shores of the Medifersanean, a France-American expedition of archeologists, under the leadership of Count Byron Kahn de Prorok, has been following a trail of dead and buried cities that flourished thousands of years ago. This trail, they hope, may lead them to the discovery of the birthplace of civilization, a "vanished continent" from which emerged the culture of the ancient Egyptians and Phoenicians, and which tradled a mighty race of people.

This remarkable scientific adventure

promises to become one of the most romantic gambles in archeology over undertaken. That it will abound in fascinating on intery and sich discovery already is indicated by the

alreadyns indicated by the most recent reports of the expedition from Djerba Usland in Tunina. In the rushing tides of a narrow channel that shourates this massic "Is and of the Lotic Biters" from the mainland, deep-sest divers under the direction of Count de Proiph have begin the search for a mystemolis aprient city believed to have been engulied centuries ago by the Mediterraneat. The search is based on statements of native aponge-divers, who say they have watched the fisher playing among fantastic ruins of the city 50 feet under water and have seen houses with walls 16 feet high, intact stairways, streets, and many-colored columns.

A swift tidal current running through the channel thwarted the first attempts of two professional divers.

Later, however, six divers exploring different parts of the channel all reported seeing much pottery, most of it solidly incrusted in the bed of the sea. They brought up 14 fragments, several of which

are 16 inches long, with mouths and handles intact, forming parts of large urns. All were covered with heautiful marine growths. How ancient this pottery is remains to be determined. Meanwhile the hazardous diving operations are continuing.

EVEN more alluring, perhaps, is the ultimate goal of the explorers—a mysterious hill-bordered tableland known as the Hoggar Plateau, lying 1000 miles across the desert in an almost inaccessible spur of the Atlan Mountains. Because of its unusual formation, this unexplored plateau long has been associated with Plato's fabled description of Atlantis, where dwelt a race of supermen who gave to the world the arts of civilization before the continent was swallowed up "in a day and a night" by the waters of the ocean.

Count de Prorok is staking his hopes on the theory that the desolate Hoggar Plateau is the remnant of the submerged continent. He believes it possible that here man first emerged from barbarism, and that colonists who went out from here eventually formed the ancient Egyptian civilization. He hopes, too, to find here a definite answer to the question whether prehistoric men, whose remains

### the Lost Atlantis

have been discovered in France, came, as some scholars believe, from Africa before the sea filled the Mediterranean basin.

May it not be possible that the same deluge that engulfed the supposed submerged city at D, erba also swept the land that is now the great desert to the south, and that the sand of the Sahara once was the floor of a sea? And before the floods come, may not this same Sahara have been part of the lest Atlantis? May not the waters have received after their destruction, leaving the bleak tableland of Hoggar rising from a sea of sand?

OT many years ago such an expedition would have been regarded almost as an absurdity. Then the story of Atlantis, braded town throught the conturies, was regarded as a myth. Today, however, science has learned that in the all uning legends of the ancients

Today, however, scients has learned that in the all gring legends of the ancients less a vast store least of knowledge. Just as the "myths" of Troy and the Tower of Babe, have been revealed as realities, so now we are quite sure that the tradition of the Deluge was more than a fable

Science tells us that 10,000 years ago, or perhaps 80,000 years, this great catastrophe overtook the world. Just at a time when the first true men were fashioning the beginnings of civilization, the Atlantic Ocean leaped its banks and engulfed them. Swellen through the years by meiting ice sheets of the last Glacial Age, the mighty waters tore through the hills at Gibraltar and poured down upon those primitive people, destroying their settlements, burying the fields they had learned to cultivate, and finally rising through the valleys until the waves lapped the mountain cliffs.

And then, thousands of years later, perhaps six or seven thousand years ago, after the waters had receded, we find a brownskinned people establishing par-

aliel civilizations in fertue lands close to the shores of the inland sea—the Mediterraneau. We find the Sumerials in Mesopotamia, in the valler of the Tigras and Englishes, and the igyptians in the valley of the Nite. And, what is arrangest of all, we find traces of the same sort of propio and the same sort of cliture, distributed in far separated lands—in India, China, Central America, Mexico, and even in England. Distinguishing this culture are certain common



Unearths Ancient Urns from Carthage

Abbe Chabot, noted archeologist and authority on Phoesician inscriptions, digging socient Punic proc in Carthage



Where Men Rosmed before the Dawn of History Members of the de Prorok expedition passing an invacion's through the garges of fields. Tunisle, where prehistoric finds through have been found in the best of a river flowing through the magnificent garge

characteristics, such as the building of crude stone strikin (megalithic) monuments, the making of mummies, Whe

known as the "swastika" for good luck.

In the old Maya civilization of Yucatan, for example, have been found many of these customs and ideas, very similar to those of the Egyptians

and the use of the symbol

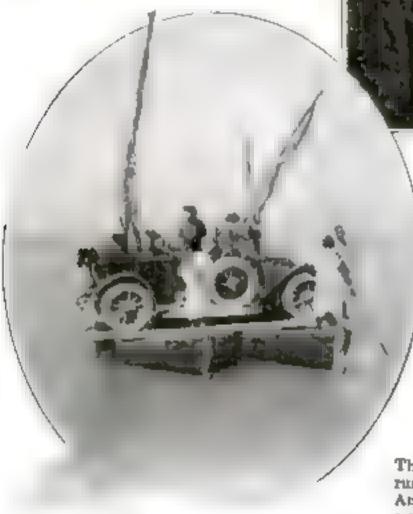
The custom of mummification runs through Central and South America. In Guatemals there is a river Nil (Nile) on the banks of which are pyramids. And only a few weeks ago, in the ruins of a buried city uncovered from the side of a hill near Arangaricuaro.

Mexico, there were found idols that are strikingly similar to idols of ancient

Where did these people, so widely distributed, come from? What was their common origin?

In his attempt to establish that northern Africa was the cradle of civilized man, Count de Prorok early this year undertook the excavation of the sites believed to cover the ancient Phoenician cities of Utica and Carthage. In Utica, temples, villas, tombs, and countless relics of civilizations that once flourished in northern Africa already have been uncovered. In Carthage he claims to have unsurthed an Egyptian culture that preceded the Phoenicians by at least 500 years, and to have found traces of at least half a dozen succeeding civilizations.

Lontinued on page 111)



A North African Ferry

One of the expedition's cars riding on an Arab dhow near Djerbe Island, where the expedition is searching for a sunbeat city submerged in the Wediterraneau



### The Wreck of the TC-6

HESE remarkable exclusive pho graphs are probably the first over made of the collapse of a dangible in the air. They were anapped by an umateur photographer tat Firt Grook Omaha, Nebr., fost at a High wind anatched the army divigion TC-6 humped its nose on the ground, and ripled the

great bag in half

Warned that a stem was prewing, 2 10 poldiers had been righed to the ship to hold it down. The officers, believing they might ride out the storm, hurriedly cumbed abound. The motors were slow in starting has the wind rose in fury. Capt. E W. Hill saw it was futile to try to take off He shouted to the crew to let go and get out of the way and the officers fumped from the cabin

At the same instant a terrific gust hit the bug and ripped a great hole in the rear. The ship crashed, nose first, ar as the hag on appeal the radicers, then from the rear, were hassed 50 varies.

Among the spectators was Walter S Johnson, an insurance agent, carrying a small pocket camera. Although little experienced in photography, he snapped four spectacular pictures of the collapse in two minutes.



The tail of the divigible, toro off by the storm, photographed as it was follow to carth. It was catried 50 yards. At the left may be seen. the rest of the blimp as it artifod on the ground, a shapeless man. Luckily no one was leart. These remarkable photographs were anapped by one of the spectators who happened to have a pocket camera with him.

### Perils Lurk in the Summer Sun

How Your Desire for "a Good Coat of Tan" May Cost You Serious Illness or Even Death - By C. F. Pabst, M.D.

NE night last summer I was called to attend one of the worst cases of sunburn I avar have seen. The patient was a young man who had spent the day at a bathingbeach and, like many persons whose opportunities for outings are few, had made the most of his time, remaining in his bathing-quit for hours under the brolling midsummer oun.

Now he was paying for his inducretion. His face was firered and swellen. His arms, shoulders and legs literally were scorched, just as if he had exposed his naked body to the heat of a blast furnace.

His eyes were narrow nista He Was neuseated and had a high fever. He acroame d with pain

when I attempted to treat him.

For three days he remained in bed, deathly ill and scarcely able to move. His was an extreme case, and yet it was typical of thousands of others that come within my own and other akin specialists' experience every summer. For few persons seem to realize that a severe case of sunburn actually is a dangerous affliction that causes not only excruciating pain, but may permanently affect the health, cause chromic skin diseases, and seen result in death

So little do people understand sunbarn that they often martyrize themselves by deliberately burning they skins, not for the beneficial effects of sunnight, but to

acquire a "coat of tan

An office worker goes to the beach for a week-end. He decides to get a "good coat of tan" and impress his fellow workers on Monday morning. He gets the tan, but doesn't appear Monday morning. He is in bed. The statistics of hours lost from work on account of sunburn, if such records were available, I am sure would be amazing. In fact, a tanned skin is no index to health. A bronzed skin may cover the most serious of body disorders.

JULY and August are the dangerous months for sunburn, for then the sun delivers the most ultra-violet light, the myigible part of sunshine that burns the skin

Ultra-violet light, we recently have discovered, helps cure many ills. It is especially beneficial in treating skin diseases such as acre and eczema. But while it is good for us to be in the sumshine, out of doors, the danger lies in getting too large a dose of ultra-violet light in a single exposure.

Sunburn is caused when ultra-violet light is stopped in the skin cells. The



He Is Courting Trouble

The office worker who goes to the brack log th week-end and sleeps on the sand in his baththat he courting trouble Monday is they to

light causes a chemical change. A poson is manufactured that enters the pood, causing fever and hendache. The chemical burn in its the skin. Some of this dead akin but to be absorbed by the blood, and this process adds to the poisoning

All this means extra work for the blood, Large supplies of blood rush to the burned surfaces with consequent disturbance of

### How to Avoid Sunburn

- Protect yourself from direct rays of the sun in July and August.
- 2. Build up a cost of tan, if you can. This deposit of pigment will prevent the sun from burning your skin.
- 3. Acquire this tan gradually through short exposures.
- 4. If you have a skin that doesn't tan, stop exposing yourself. For you, every new exposure m burn.
- 5. Wear a hat with a brim or carry a parasol.
- 6. Don't go to sleep on the beach in direct sunlight.
- 7. Don't go flehing or boating in the middle of the day in sunshine. Reflected light from the water will burn you, even though you wear a hat.
- Remember that a severe case. of sunburn may have serious and lasting results.

the circulatory system. This may be followed by congestion of the lungs and inflammation of the kidneys.

The heat of sunshme has nothing to do with the burning You can prove this for yourself Expose your arm to a 90-degree temperature before a fireplace or immerse it in hot water. The akin reddens, but the redness disappears when the best is removed. Expose your arm in direct sunlight of the same temperature for two or three hours and you will receive a burn lasting for days.

Sometimes, not always, sun-



Frecklea

The weather-besten skin of Earl Sende, fismous American jockey, who rode Flying Elsony to victory in the uset Mentucky Derby la typical of the kind that freckles, material of tana. In other words, the pigmentation or discoloration of his sken, instead of being distributed evenly collects in small spots

burn in followed by pigmentation—dia coloration of the skin—the familiar "coat of tan." Sometimes this pigment, instead of being distributed evenly, collects in spots that we call freckles. The pigment is manufactured in the deepest layer of skin cells. Under a microscope the pigment looks like tiny particles of brown paint. The more of these particles manufactured, the darker the skin becomes.

But perhaps you are one of those unfortunate individuals who never tan. You suffer far worse from sunburn than your bronzed companion. Why?

The latest experiments with ultraviolet light lead us to believe that the

(Continued on page 113)

# The Wonder City You

Buildings Half-Mile High and 4-Deck Streets



Harvey W. Corbett noted American architect, at work on one of his coulds deporting his conception of the fathers of the

two pages were drawn from suggestions made by Harvey W. Corbett, president of the Architecturas League of New York. They are a vivid, graphic expression of Mr. Corbett's mental conception of the typical American city of the future—the place in which most of us will be living in a quarter of a century or so.

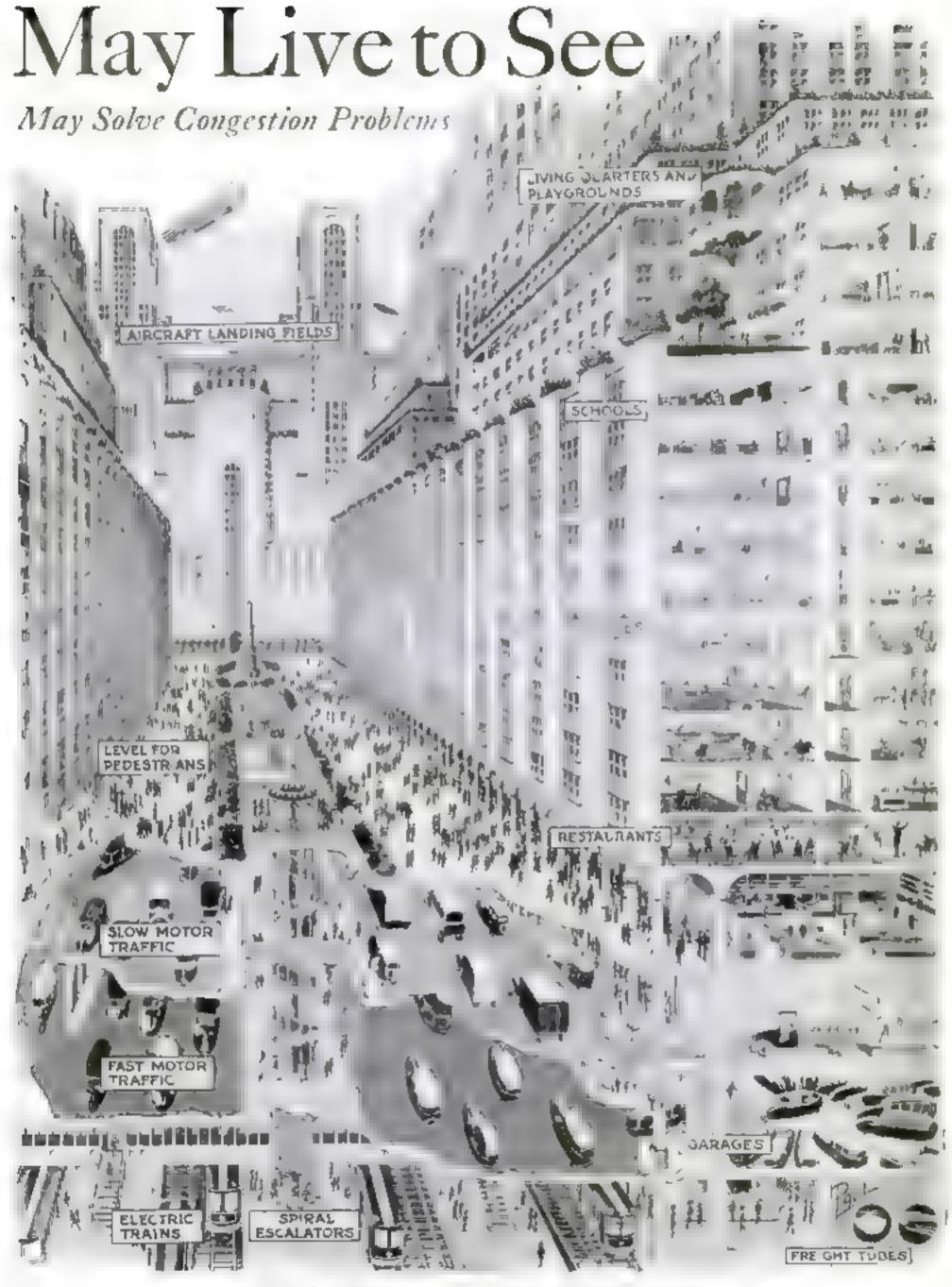
Unlike many other experts, Mr. Corbett does not be execute that the future will bring the "decempendation" of our big cities on the contrary, long study of modern treats in architecture, city planning, and business and docur life has convinced I so that our lifes we recorse the authority of the grant of the grant who is the grant with the convinced of the grant who is the grant of the grant which with an even of the grant or the property with an even or the property of the grant or 
Tile structure at the order of the wall consist of for the structure of th

Banderge will be half a toole high or the second commercial to over home a discussion of the second to the toolean and the second to the second to the second to the second to the second tool 
Though Mr. Corbitta vision of the future city contains much image at a contains much image at a contains no sense fantastic. It is supplied to a tractical man and a noted architect. The ideas are wantly of sober study. A posture of the presents at maximum, with the same impression at an aways, would have seemed scarrely more remarkable future city seems today.



#### Safe Highways - Elevated Parks

Above an conception of how highways from the case of the mone will be arranged a prevent congestion. Notice how the stop highway a cirvo of with an ingention apparent of curved ramps leading from one highway to the other. If you follow the arrows you will see how a contraveling in either direction on either road could pass readily to the intersecting highway without danger of accident. Mr Curbett foresees future city packs raised to the level of elevated streets, as shown at right with convenient mito parking space beneath



### How You May Live and Travel in the City of 1950

Future city streets, says Mr Corbett, will be in four levels. The top level for pedestriens: the next lower level for allow motor traffic, the next for fast geotor traffic and the lowest for electric trains. Greek blocks of terraced skywerspers half a mile high will house offices, schools, homes, and playgrounds in successive levels, while the roofs will be signaft landing-fields, according to the architect a plan



By Arthur A. Stuart

RULY revolutionary in principle is a new propeller for motor-boats and aircraft recently designed by Prof. P. K. Kersten of the Department of Electrical Engineering at the University of Washington, Seattle, Wash

The amazingly simple mechanism serves at once as propeller, rudder, and reverse gear it is in the form of a rotor or disk, set in the bottom of a boat. A number of blades project from this disk into the water. They are driven by spiral barel years from the angine.

The thrust upon the water is produced in two motions by these badds. First the axes of the blades are caused to move in a circular path with a uniform motion, the plane of the path being at sight angles to the blades axes. Second, while moving in the circular path, the blades are made to rotate on their own axes, this motion are no times that each revolution

made by all the blades around the circular path and makes onehalf a revolution of each blade on its own axis. The consequent thrust given by the combined movement is controlled at will by a simple device incorporated in the propeller.

THE propeller blades revolve not only on the rotor's motion, but also independently of it. It is claimed that any boat equipped with the new propeller can navigate safely without reverse gear or rudder. The boat can be turned almost in her own length, so quickly will she respond to the action of the new installation. Again, it is said that even when going at full speed, a boat can be stopped in two lengths.

All movements are governed by the way the propeller blades are manipulated. In turning, a boat How Propeller is Installed

Elizatrating the position of propelle on latest model streamlined motorboat. It is claimed by the investor that need for rudder and reversing gene is claimened by any of this sevention.

banks inward; danger of capsizing is therefore aliminated. The makers claim that boat construction a capsiderably simplified and that, due to the centerboats installation, which stallings the boats the sness streamlines may be adopted

So impressed was the U.S. Government by the new propeller, that after repeated tests at Washington, D.C. it has ordered an installation of the aerial type to be made in the dirigible Shenandoch, and the marine type placed in the "admiral's barge" of battleships.

All the advantages claimed for the instance type of propeller, and even more, are claimed for Professor Kersten's serial model

Yet another new propeller, but of

entirely different construction, is the invention of a Frenchman, Jean B. Icre. The Icre propeller consists of a vertical housing through the bettom of the hull, with a simple mechanism that operates six propeller blades around a horizontal circle, requiring only a one-way power plant to drive it. This means that all engine-reversing mechanism is eliminated

THE actuating mechanism is simply a cam at the end of the blade arm, following a circular guide within the housing. This guide causes a quarter-turn only of the blades from the horizontal to the vertical and return.

Because of its construction, maneuvering, such as is required of destroyer ficets, is said to be possible to a phenomenal degree.

It is claimed that in tests conducted in a 40-foot vessel with engine running a corresponding number of revolutions, the less propeller covered a given course in

> from six to 12 per cent less time than that required for a screw propeller

> The basic principles of M. Iere's propeller have many applications—as for outboard motors, certain phases of dirigible control, and for deep-draft vessels, shallow-draft vessels, and particularly for tow-ing specific



No Budder nor Reversing Gear Needed

The Tee properly his a versus, hour of through the bottom of the boat a hull. A simple mechanism operates six propelling blades on a horizontal circle. Revening poor is diminated.

### Tailless Biplane Tested

POLLOWING recent trial flights near Santa Monica, Calif., a tailless biplane weighing less than 500 pounds was declared practical by Prof. A. A. Merrill of the California Institute on Technology

iforms Institute of Technology
Such a machine in immature,
shot from a catapult, sailed more
than 100 feet and maintained a
speed of 15 miles an hour. It was
held perfectly balanced in the air
by currents from four large motors.

Where nightsticks are

useless and shooting uncalled for policemen now are using the billy shown be-

low It will project a attention of blinding mustard-campber liquid 30 feet.

### Tear-Gas Bombs Rout Mob

Army Trains Police in Use of War Gases



ODERN warfare methods are being adapted for use by police departments in several large cities in the United States. Tear-gas bombs, green also makes, and billys are used for attack and defense. A gas we will be a suggestion of the claimed, will enable a suggestion of the configuration with the old type of night-frick.

The mace shoots out a very of gas, enough to fill in ordinary room. The grenades are said to a part marly affective for bleaking up mobe and riots and driving harricaded criminals from retreated Huge crowds can be set to we pink instantly, so that not one of their number can see, and no mob will continue once blinded with irritating tears.

Smarting of the ayes and tears continue for from two to five minutes after exposure to the gas. The exposure is harmless, since the gas has no permanent injurious effect.

The mace has the same size, shape, and weight as a standard police night-stick. When pointed at a man or group of men and a button pushed, a cloud of tear gas

is projected from the end for a distance of from 20 to 30 feet. The charge is much like a shotgun shell and can be installed easily. The billy is like the mace, except that the barrel is shorter.

One hand grenade, it is claimed, will

#### Using Gas for Self-Defense

Above. Officers demonstrating how a bank remember can shoot gas at would be hold up man, rendering him helpless and unable to resist acrest. Centert Soidiers instructing fan Francisco policemen how to shoot tear bumbs from a rifle. Some of the police students shown in the Bustration are carrying gas masks, which they must learn how to use

stop a mob of hundreds in an 80-foot street. Thrown into a large hall, a tear grenade will cause every occupant to retire basily. The grenades do not expende, he weather-proof, and are provided with a lafety device so that they can be stored indefinitely

Riff grenades are built on the same lines as hand grenades, but these can be fired from a rife with blank cartridges. These weapons are used when greater range is desired by the men who are using them.

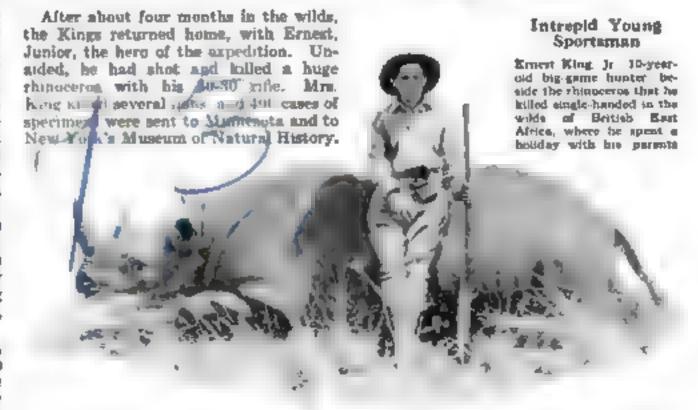
At army posts soldiers are acting as instructors to policemen, showing them how to handle the new tear-gas equipment

### Ten-Year-Old Boy Is Hero of African Hunting Expedition

NE day last winter an interesting party sailed from New York for Nairobl, British East Africa, It consisted of Mr and Mrs. E. L. King, of Winons, Minn., and their 10-year-old son, Ernest. Accompanying them was an official photographer, a motion-picture cameraman, and an expert taxidermist from New York's Museum of Natural History. Mr. King also had been commissioned by the University of Minnesota to get specimens of big game.

Escorted by a saferi of 76 natives, the party entered the jungles of Africa I hough it was then first experience with the big game of the dark continent, they were by no mean amateur, having hunted in South America, Canada, Alaska, Florida and China.

Mr. King a well known marksman, and Mrs. King was at one time world's champion clay-target shot, and twice champion of the Northwest, while their son has handled a rifle since he was six.





# There Are A Thousand Different Insects in Your Back Yard

Amazing Stories from a Near-By World of Bugs and Flies

Frank E Lutz was showing a triend the back yard of his suburban home in Ramsey, N J The two men were examining a perubar-looking meet on a rosebush. If the course of a convertation about insects Doctor lists regisphed, "Every year there are at least 500 species of insects in my back yard." The friend expressed surprise and akepticlary and Doctor Lutz determined to prove by Today in the American Museup of Natural History in New York.

The friend expressed surprise and skepticisms and Dactor Latz determined to prove to Today in the American Museup of Natural History in New York City, where Doctor Lutz is Turator of the Department of Entomology, there is a collection of 836 species of insects that were aught in that one New Jersey back yard. And the collection is incomplete. When all of the specimens are mounted and labeled, Doctor Luts expects the exhibits to amount to well over a thousand. One thousand different species taken from a plot 75 by 200 feet!

All of us who have a back yard are

probably hearding as many varieties of guests—perhaps more, for the garden in this case is in no way unusual. It is in the middle of a village of about 2000 population. Part of it is planted in vegetables, part in flowers, and part is lawn.

The surprising collection moreover, was made casually, during two summers. The insects were caught while Doctor Lutz was stroiling in his garden, or when the electric porch light attracted awarms of them, on summer evenings.

In all but one of 23 general classifications into which all insects are divided, representatives were found, either in the you can find fully be many in your own gurdens. You will be for them.

By G. B. Seybold

Sering your principal insect visitors



Here is the friendly lady beetle disting on destructive plant are or aphids. These See have now become the service 'cowe of auto



Corner of Doctor Luta's back yard at Russey N. J., where he found at least a thousand different opening of itsects

into groups easily remembered, you have (1) true thes—those that have no more than two wings—such as mosquitoes; (2) butterflies and moths (scaly-winged insects); (3) beetles; (4) wasps, bees, and ants; (5) true bugs, such as the squash bug, which have sucking mouth parts, and (6) gramhoppers.

BUT what about spiders? With that question you disclose a slight acquaintance with insects, for a spider is no more an insect than a crab is. For one reason it has too many legs—two too many, to be exact. Only six-legged creatures come under the classification of insects, and a spider has four pairs.

The inserts in your back yard belp themselves to the foliage of your fruit trees, bushes, vegetables, grass roots, and plant stems. Every plant in the garden furnishes refreshment for at least one spacies of insect. Some insects, such as the roach, prefer cooked foods. What-

ever man likes in good enough for him, so he sticks close to kitchens, where he manages to steal a bit now and then. Roaches have tagged man about the world for thousands of years, even following him on ships when he crossed the seas.

The most numerous of your back-yard guests are aphids, or plant lice. If left to grow unmolested, the hordes of these would bring starvation to all of us, by destroying all vegetation. Next in number in the garden are ants, and a distressing fact is that these two classes have joined forces.

The lice are the anta' "cows."
They excrete a sweetish sub-

stance called "boney-dew," which is very much liked by certain species of ants. These ants work hard to care for their tiny "cows."

ONE species of ant, the Louis niger, exercises particular protection over the corn-root aphid. During the winter this ant stores the small black eggs of the lice in its nest, moving them around as the weather changes, to keep them dry. When the eggs begin to hatch in early spring, the anta uncover the roots of smartweed and other plants and put the cows out to pasture. Then, when the former has at length put in his corn crop, the ants make a last transfer and transport the lice to the corn roots.

Fortunately for us, lice have enemies as well as friends in the insect world. One of these is the saily-heetle. All of us know the little rhyme warning the lady-bird to fly away home to save her children from destruction from firs. Doctor Luta explains that the rhyme ongo

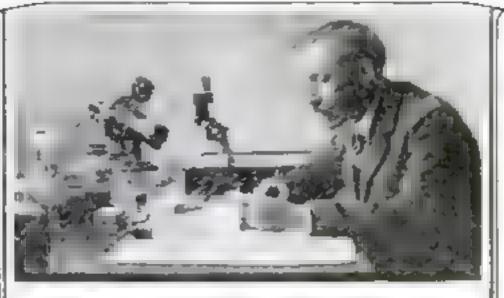
nated in Europe, where her vines are burned after the harvest. These vines are usually full of the young of ladybeetles dining on plant lice. The name "lady-beetle" dates from the Middle Ages when these insects were dedicated to the Virgin and called the "Beetles of Our Ludy."

Horticulturists in Culifornia, realizing at the good these beetles do, often scoop up big masses of the adults from the piles in which they congregate for the winter, and put tons of them in cold storage. They distribute them in the season when plant lice should be controlled

Another enemy of plant lice often seen flying about electric porch lights in avenings, is the aphle-lion. This is a rather large but desicately formed crea-



The Complete-Ground of Peats
A colony of tent caterpillars in the forks of a
tree. When these peats are gathered in
their tent it is possible to destroy them easily



### Opens World's First Insect Zoo

THE most amazing soo in the world—a 40-acre menageric of insect life—has just been opened to the public in the Interstate Park near Tuxedo, N. Y. It is the idea of Dr Frank B. Lutz, Curator of Entomology of the American Museum of Natural History, who is shown in the physiograph

shown in the photograph

Doctor Luty's foremating observations of the thousand insects in his own back yars are described of the accompanying applies allow, under his direction, the described of the accompanying applies at the public a chance of view and study times windlers. As at its at the soundly learn of Nature's areful jobs for our bugs beetler, bees, and flies.

Doctor Let has estimated that this remarkable zoo mul-contain a least 500 kinds of insects.



Two Interesting Creatures

The upper picture shows a dragon-fly or darning-needle caring an lasect while in flight. This vicious-looking but harmless fly twoops down and accops up its prey in its tmaket-like legs. Below is the aphis-how, a varactors county of plant face. Doctor Lutz tried to count how many face one of these could devour in one meal, and gave it up

ture with light green, lacy wings. Its young are so voracious that if it laid all of its eggs in a mass, the first one hatched would eat all of the rest. So the mother spins stalks of stiff silk and sticks one egg on the end of each stalk. Thus all are given an equal chance.

Doctor Luts, curious to know just how many plant lice one aphis-lion could consume at a single meal, tried to keep count one Sunday afternoon. He got tired counting, he says, and turned the insect loose on the honeysuckle vine to keep on with the good work. Doctor Lutz goes out into the fields, gathers aphis-lions and turns them loose in his garden. One of

the best ways to control insect pests, entomologists advise, is to stir up warfare. Increase the number of the pest's enemies and let them fight it out, cheering from the side lines.

Craftiest of all garden insects is the feroclous-looking doodlebug or ant-lion which develops into the marsh fly, resembling the slender-bodied dragon-fly but with more delicate wings. Bright lights have a fatal attraction for it, so you may make its acquaintance some night when you have forgotten to mend the hole in your window-

The doodlebug larve makes a pit in loose gravel the shape of an inverted cone and hides at the bottom with just its powerful jaws protruding, ready to seize its prey. An ant or other insect tumbles into the trap, assisted in its fall by showers of sand thrown up by the ilon. Once in the pit, the victim's fate is sealed.

Few insects are injurious in all stages of their life. In fact, as a rule, it is only the grub or enterpillar that does the damage.

Some insects are often easy to see and destroy in one stage or another. The eggs of the tent caterpillar, for example, are deposited in bands, 800 or 400 to a band, encircling a small twig of some tree, preferably an apple or wild cherry. These bands are rounded at the ends and covered with a protective "varnish." In the winter, when there are no leaves to hide them from view, they can be detected easily and destroyed.

TENT caterpillars have an interesting colony life. When the eggs batch, all the caterpillars join in spinning a temporary silken tent around what is left of the egg mass. From here they go out (Castinged on page 147)



A Buttle in the Flowers

One of many thrilling battles of the insect
world. This remarkable photograph shows

a bornet sweeping down to attack a box

### If He Should Let Go

master at performing heir-raising stunts on the outskirts of an airplane, thousands of feet above the earth. He clumbs from the fuselage, steps lightly out on a wing, and dangles in midair, supported only by a wire strut

### Try This on Your Motorcycle

biotorcycle rodeos furnish a constant supply of hairbreadth escapes from injury or death. Albert Milner, champion trick motorcyclist is pictured above, doing a very difficult stunt



### Suspended between Earth and Sky

Above: Benny Fox calls himself the "human fly" and he is shown performing on a rope high above Chicago's streets. At left: Carl Anthony, of Oakland Calif, has elimbed to the top of the flagpole of the Oakland Tribune, some 300 feet above the sidewalk, and is doing basardous atunts on the spex of the slender shaft, nonchalantly supporting himself in one hand and meantime keeping his balance with an umbrella, closed, at that

### Florida's Human Torch

Providing thousands of spectators with thrills and chills, Daredevil Wilson daily climbs this ladder, saturates himself with gasoline, sets fire to his clothing, and plunges from the disry height of 125 feet into the water-tank below.

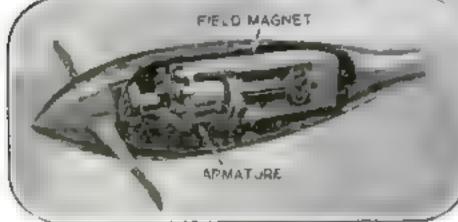
### Pilot Controls His Speed by Sound

HE perfection of a remarkable acoustic speed indicator for furplanes, which makes it possible for a pilot actually to hear the speed of his machine in flight, recently was an nounced by M. de Gramant de Guiche, before the French Aundemy if Science.

The invention is a small torpedo-shaped instrument, with a two-bladed propeller at its note, ittached under the fuselage. Air pressure set up by the plane a located motion drives the propellar, which, in turn, drives a small alternating suprent generator. The speed of retation, of course, depends on the speed of the sirplane,

The propeller shaft is placed between the arms of a fixed U magnet, which and in ring-shaped pole plates. Between





#### How the Sound-Maker Operates

The picture above shows the location of the winddriven accountic speed indicator under the fuscings. At the loft is a broken-away view of the torpedoshaped instrument, showing design of the alternatingcurrent generator that produces a humming sound to an empired were by the pilot. By variations in the pitch of this sound, the pilot with a little practice, is whit to judge occurrely the speed of his plane



these plates the wire-wound spool of the generator is mounted around the shalt, without touching it. Between the end plates of the fixed spool and the armature rings of the magnet poles, circular disks are keyed to the shalt. Each dust has

eight teeth, corresponding with the same number of teeth in the armature rings

As the propeller shaft revolves, an alternating current is generated. This reaches its maximum every time the teeth of the disks are almed with the teeth of the armature rings. Thus each full revolution produces eight maximum impulses that are transmitted to an earpiece worn by the pilot, creating a humming sound, which varies in pitch with the speed of the plane

### A "Second Wind" for Airplanes Six Miles Up

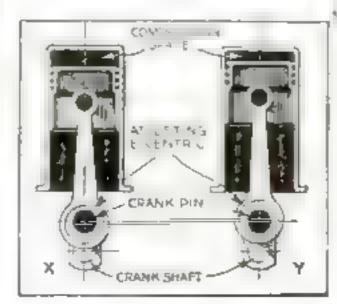
ROM New York to Paris in a few hours is one of the possibilities held forth by Louis Damblanc, as a result of his invention enabling airplanes to fly swiftly at high altitudes.

By a simple apparatus built into the engine, this French engineer distinct to have mastered the upper atmosphere in way never before apparations.

Under present conditions an tengine loses half its power at an altitude of 3 % miles. With the Dambiale attachment it is declared the loss will be reduced to little for nothing even at a height of six miles. The French Air Service has supervised successful tests of the apparatus, the importance of which is undicated by the fact that it was laid before the French Academy of Sciences by President Paul Frudent Painlévé, of France.

In upper sititudes the speed possibilities are vastly greater because of lessened atmospheric resistance. With existing equipment, however, the loss of angine power has made it impossible for aviators to take advantage of this.

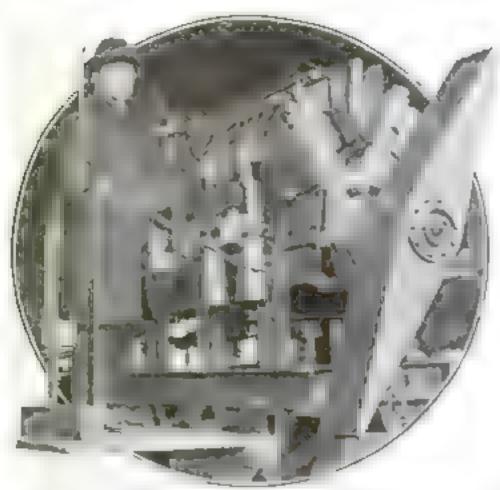
To overcome this difficulty by increasing compression in the cylinders. Damblanc has modified engine construction to enable the pilot, at will, to change the length of the connecting rods that move the pistons in the cylinders, and so vary the space in the compression chambers. The secret of the device less in the eccentric erank-pin arrangement. When the eccentric is set at the point shown at I in the theoretical diagram the compression ispace is reduced and the motol will function at high airitides. When the eccentric is in the coper position of minimum ringation shown a I the piston does not go as far into the cylinder. This enlarges compression space, and so lowers compression to the proper point for running at ground level.



The Power Booster

Above is an implane motor equipped with the new power-increasing device. Arrow A points to the housing of the device; arrow B points to the adjusting lever. The diagram shows the eccentric crank pin arrangement by which compression space in the engine cylinders is reduced at higher altitudes. X shows pointed for running at ground level, and Y for high attitudes, changed at will by the pilot

# Dangers in Bolting Your Food



New Engine for Transattantic Flight

Rene Foncis. French not of aces during the war is shown here with the new steplane sugine he has designed reportally for transctionatic flight.

This motor has run on the block at full append for 120 hours continuously

O YOU know the practical, dollarsand-cents value of keeping well informed? Are you moving ahead
with the world's advance, or are you letting yourself slip backward? It is to help
you keep pace with the progress of events
that POPULAR SCIENCE MONTHLY presents
here, in brief, understandable form, the
month's outstanding achievements in
invention and scientific discovery.

BOLTING your food is extracely danperous, for this common had a largely
in responsible for the increase of cancer in
the United States, Dr. J. D. Osmand, of
Cisveland, Ohio, explained recently before the Radiological Society of North
America. When a man under nerrous
attain, he said, swartows his food in chunks,
it tends to be retained in the guilet instead
of going on to the stometh. This irritates
the guilet and frequently causes cancer.

Scientists throughout the world are paying an increased amount of attention to the rapidly spreading plague. Sir William A. Lane, a noted English surgeon, blames the unnatural habits and diet of civilization for cancer. The body is poisoned slowly, he says, because the residue of digested food remains in the body longer than it should and stagnation sets up local irritation.

This could be prevented, he adds, if we would eat rough foods as our uncivilized ancestors did, instead of prepared foods, highly cooked, milled and refined. The cause of every case of cancer he has ever had the chance to verify, he asserts, has been chronic constipation.

New York City is to be the first municipality in the world to erect a cancer institute of its own. Sufferers from cancer will have free treatment by the latest radiographic apparatus and a 200,000-

### The Month's News of Useful Discoveries and Inventions Told in Easy-to-Read Words

volt X-ray machine. The latter will be housed in an inolated one story building, having thick walls lined with lead, no that the powerful charge of electricity can be used with safety.

It is amazing that in spite of these tremendous efforts to conquer enheer, it should still remain one of the most dreaded diseases known to man.

### A New Grain

Don'T worry world starving to

death. You have heard it said, perhape, that the corn and wheat areas of the earth now are cultivated to the limit, and that some any the increasing popunition will not have enough bread.

Be cheered by the news that P J Wester, a scientist of the Palippine Board of Agriculture, has discovered remarkable possibilities in adlay, a grain grown in the tropics. He says it will take the place of either wheat or corn, if need be

We are acquainted with one of its near relatives—Job's tears, hard seeds used often for ornamental beads. The adiay has a softer shell than these. Natives in the tropics have used the seeds for generations for ornamental purposes, but not for food, because they could not be hulled easily by primitive methods

One great advantage is that the same machinery used to mill wheat can be used for the new grain. Experiments have shown that the best bread is made by mixing it with wheat flour in the proportion of one-third to one-half adlay. When more than two-thirds adlay is used, the bread becomes heavy. Cracked adlay

The plant is a kind of coarse grass growing seven or eight feet high, with long leaves similar to those of corn. The grain

is inclosed in a soft shell. It has an amax-

ing yield—an average of 2650 pounds to the acre.

### Spider Webs as Fish Nets

IF YOU lived in a tropical country you might become lazy, too, and use your wits only to figure out some way to get work done for you. Natives of Australia and the South See Islands induce spiders to furnish them with fish nets.

The webs are spun by large spiders with bodies about two Inches long, and are extraordinarily tough and durable. Natives bend a strong twig into a hoop, take it into the woods and wave it among spider webs apun between branches until the hoop is covered with meshes. Fish become entangled in the tough web when it is immersed in a stream, and are caught

Natives of New Guinea bend a piece of hamboo into the shape of a big tennis racket. They place this upon a bush and



At Work to Purify Our Rivers

Miss Louise B. McGrazh, C S. who holds the distinction of being the only woman chemical engineer in the United States, is at work with Unite Sam to prevent the pollution of streams. Here she is, operating an apparatus that purifies water used in factories

Cables Teated in a

"Chemical Ocean"

spiders obligingly weave a etrong web upon it. Fish up to a pound in weight can be caught in such a net.

### Daring Adventures

THE world is full of adventure for the man who seeks it. Into the midst of tribes of savage Amazonian head-hunters who greet visitors with possoned arrows, an expedition led by Dr. William McGovern la penetrating this summer. The explorers will study the mysterious customs to be found in South American country between the Andes and the Amezon valley.

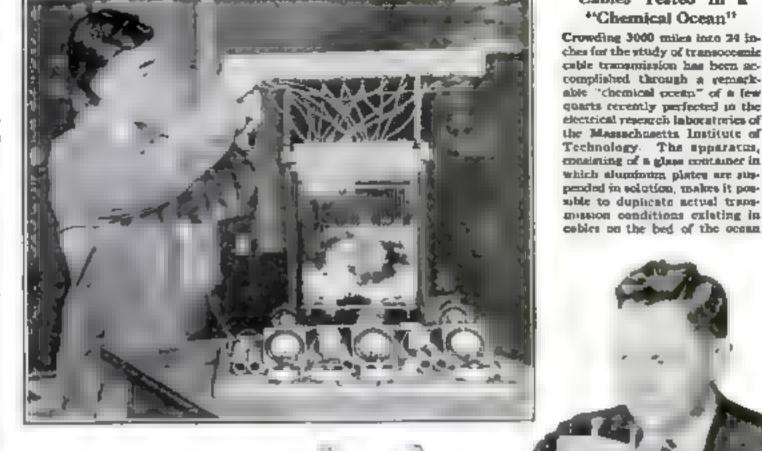
Little is known about the savages here, except that they keep pigmy slaves and shrink the heads of victims, by a secret process, to the size of an apple. The explorers expect to impress the natives with jass records and radio.

Dector McGovern was the dering adventurer who, dis-

guised as a servant, got into Lhasa, the forbidden city of Tibet, about two years

In Baku, Azerbaijan, on the shores of the Caspian Sea, another party of adventurers is digging for the treasure of Alexander the Great. A romantic feature is that the archeologists are following directions in an ancient map said to have been stolen from a Turkish sultan many years ago. Lugend declares that this map shows the exact spot where the riches are buried.

At home, one of the most ambitious feats of American mountaineering is being



He Photographa Interior of Rife Barrel

By means of a remarkable prelacopic camera invented by Dr. I. O Garda Case, it now is possible to photograph the interior of either a rife and common berrel

climbers, who are attempting the sacent of Mount Logan, the highest mountainent Canada. It is 49,650 feet high, second only to Mount Signification in North Amer-rea, and has forer seen scaled. penious route manned out by Captain Albert Mr MacCarthy of New Jersey he expedition of under the auspices of the Alpine Club of Canada, but it includes five cumbers from the United States. The summit of the peak is 11,000 feet above the highest available base site,

#### Achievements in Flying

"HREE planes designed to fly 300 miles an hour are being built for the United States Army and Navy for entrance in the

Pulituer Trophy Race this fall. With these it is expected that the United States will recover the world's speed record from France, which now holds it at 278 miles.

A new world record for non-stop flights was made recently by the PN-9, an all-metal naval

plane, which say 28 hours and 36 minutes without stopping. It came down only because its supply of gasoline was ex-bausted formined 1450 gallons.

The test was made to see whether the plane could hop from California to Honolulu successfully. From the speed maintained in the trial it was estimated that the plane would have flown just far enough to have covered this distance.

### Our Mentality Exposed

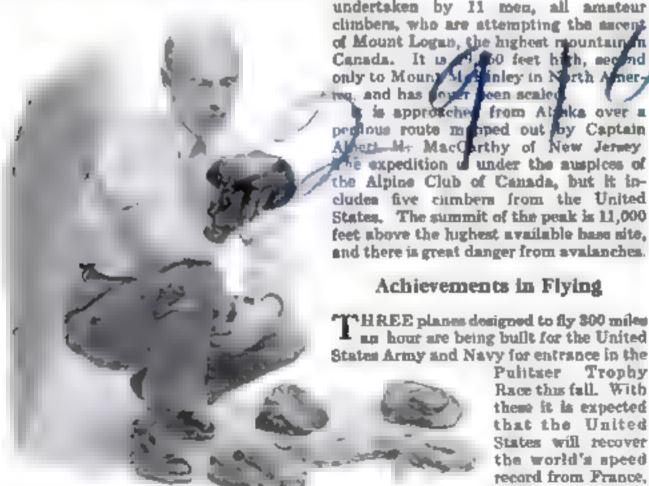
MUST we admit that we are stupid? A group of University of California scientists, after many years of study, bave decided that the human race has made no mental progress in 3000 years. They have concluded that we know about as much today as the people who lived in Babylon, and not as much as the Greeks did 2000 years ago.

Doctor Robert Millikan discovered that by merely substituting familiar names of persons and places for unfamiliar ones in writings of the ancients, these writings could not be distinguished from the modern.

And people are still shamefully superstitious, it was found. One test showed that of 977 California teachers 875 believed seriously in black cats and dropping spoons as omens.

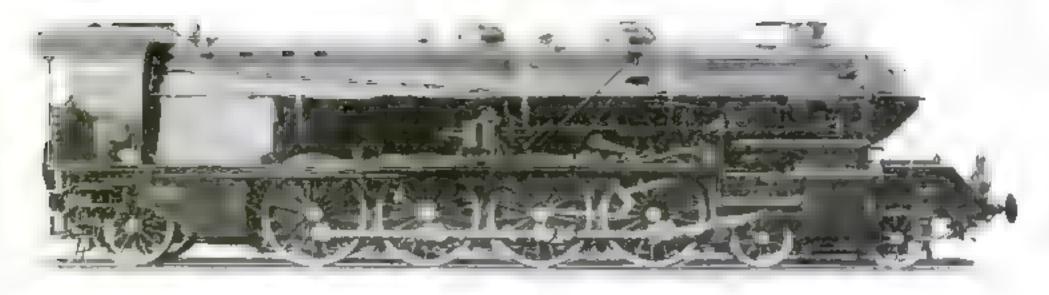
Criminals as a class are as intelligent or more so, than the rest of the world,

(Continued on page 114)



Odd Snakes from Africa Arrive at Zoo

Officials and keepers at the Brons Zoo New York had so exciting five hours recently when a large shipment of makes, including deadly black cohess, mambes, and pythone, serived from West Africa. Doctor Raymond Ditmara, curatur of reptiles at the 200 is shown, here with a group of harmless hall pythous. When frightened, these peakes cell themselves up in a hall for protection from intropion



### French Mountain-Climber

Designed to haul heavy passenger trains of high speed over steep grades between Park and Marselles, France, this new strengthned loss notive is said to be the most powerful in Europe. It develops as much as 2500 horsepower

# The Old and New in Engines

Remarkable Advances in Locomotive Design



Nearly 100 years ago President Andrew Jackson adjutened a Cabinot manufact to see the Affarit, the first logomotive that ever pulled into Washington D. C. Today this old times (above is still able to run under its own steam. It was built by Phiness Davis of York, Po.

#### Runs by Batteries

Storage batteries supply the driving power for the Butter of Diese right, a new types of Diese of the batteries between the said to have tremendous in thing power



#### Trackless Train

What is declared to be the warth shret trackless train is a first trackless train is a first Now York to Land Low notice and steping on roll on automobile which

### Railroad "Came"

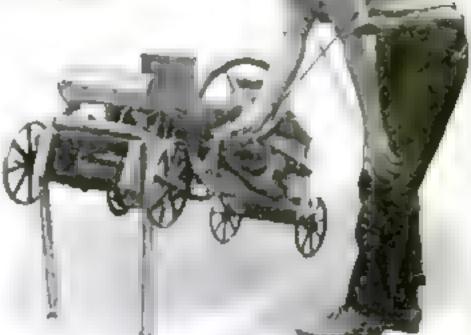
In recent tests in the Swedish state of the system tween Stockholm, and the Gothenburg, a part type I seem take the latter (antel right) is not to have constant to have constant as much water shall 40 per cent less fuel than used by the ordinary occurretive. It has a special condensation apparatus invented by Fresirik Ljungstrom, a well known Swedish engineer



# Oddities of Motordom

Ingenious Creations in Gasoline Cars





### An Automobile for \$3.50

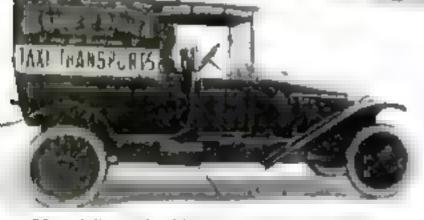
A Roman uprtawo-man, r rgot wantham ast, saw no reason why yelisti moult put have a much profession as cupants of a closed So she designed This Ingenious top that covers both the motorcycle and its sidecar

Cycle Sedan



### New Mail-Car

A three-wheeled maildelivery car of motorcycle type (lefting cently was adopted by the German small two-wheel trailer for carrying heavy mail-sacks



### Novel Freight Taxi Appears in Baris

This light and speeds beight card is a recent annovation in Paris, France IV deliver packages and bundles for any body, anywhere is the city. Deliver charges are determined according to the mileage readules on a meter

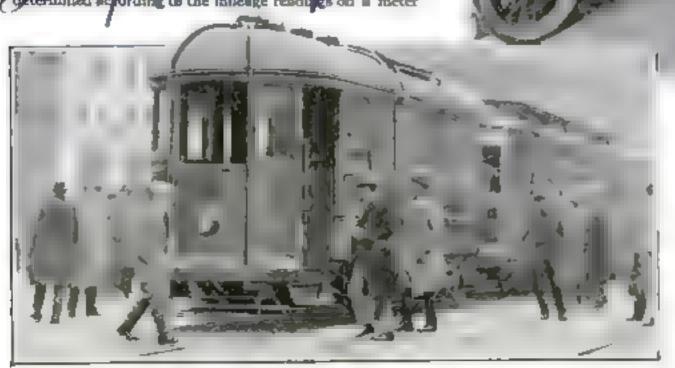


### Midget Motorcycle

The lattle follow adust have one day dad a. This time a German many factorer has made for him the small est motorcycle. It weighs only 30 pounds, yet is equipped with every thing that goeson a full size machine

#### Gasoline-Driven Streetcar

A remarkable gasoline-driven streetear at the left recently was put in operation, ht. New York City While it carries its own passengers, it also serves i it is obcessory as a power car for the ordinary siteemar trailer



### Now Patients Drink Sunlight to Cure Disease

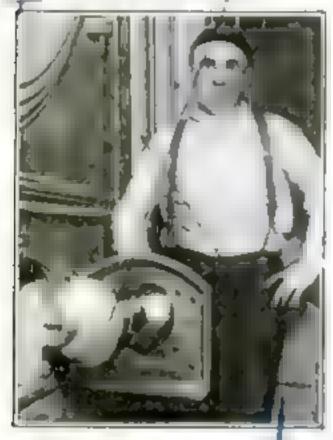
Y MEANS of a new ultraviolet-right muching the curative powers of minlight can be administered internally.

Sunlight long has been used in the treatment of hyperous diseases—in factor a proper of the ordest and most effective medicines, but to a west extent its use has been highled to certain diseases. The scope of this natural curitive power, through the me of this ultra-violet-light much ne, it is claimed, will be enlarged greatly,

Use in the mouth and throat, It is reported to have proved beneficial in cases of several diseases. The machine was

shown recently at a numing exhibition in London, where it drew much attention and favorable comment.

### Fuel-Saving Smoke-Consumer Made of Scrap Iron



ANY plan or device to see the unif manufacturing and investes a ris est. tain to have an immediate vaor reed kammer, of K nonnad, has we sat set designed to serve any as a to . **SERVICE** 

The devices constituted of acrap from and, as the smalls earred out in a Cinwhich preheated nir, admitted over the fires in the boilers, is said to bring about perfective mbustion. Since their in- a-ation several months ago, the smokeofigumers are reported to have saved about 40 tons of fuel for the point

The picture shows Engineer Kammer standing beside a boiler equipped with one of his fuel-saving smoke-consumers.

### Cork Houses in England

OMPRESSEDicord corner with 112 the building of houses at Deal, England It is said to be fireproof and soundproof.



How nitre-violet light is administered internally with the new machine.

### Lightning-Rods for Trees

SO SUBJECT are trees to being struck by lightning that the rodding of valuable trees to protect their from possible destruction is advised by tree experts of the Department of Against the laws shown that the look is street by lightning more often than other tree. The alm, ash and

poplar also are susceptible

### "Radium Chain" for Cancer

N ASTONISHING new treatment A for cancer by "radium chain" recently was described by Dr Sidney I ankhauer of New h and City. The chain he said to made of these platfaum links, with insules containing radium connations. These are increed in rabber and weighted with a gold ball. The chain is nevallested by the nevallested by the neverthese and beauty in the chain in awallowed by the patient and kept in the intestines several hours a day.

Simple Window Support Does way with Sash Cords

> NEW device for support-A ing windows in any posttion, without the lat of sash cords, weights, or halleys, accomplishes its purpose through

a roller and a supporting bracket made of spring briss. The bracket is attached to the such and carries the roller horizontally when the sash is being raised. One end of the roller ist confined while the other haster alight play, allowing it to resume a slanting position the force of gravity. on the such The resulting frietado et la claimed, le sutilcient to hold the sash in place, but yields readily when the

window is pulled down.

The approx construction prevents ratthe supporters are used on each side of a such weighing not more than 13

pounds. For heavier windows more of the supporters are used. The device is said to be less expensive to install than are the usual weights.

A RIFLE the size of a light machinegun that will shoot homba a distance of two miles is reported to have been invented by R. Okamoto, a Japanese engineer.



Section view of bush charring outpractor

### Roofing Plant Carried on a Small Truck

ROOFING company of Reading, Pa., instead of using scrap wood as fuel for melting the pitch med in routing, as most roofers do has constructed on the rear of a Ford chartes a modern oil burn-ing heater. The lump pitch is put in through a door at the top of the heaver and the melted pitch to drawn off at the bottom by meanwol a large affigot

An oil-burner somewhat similar to those used in oil-burning house furnaces fits in

the bottom of the heater. A 60-gallon tank, present behind the seat of the car supplies the fuel out By means of a small hard pump on the dashboard, 20 pourds air pressure is maintained in the tank Pumping is required only once an hour during the operation of the heater.

Labor costs are said to be reduced considerably by the oll-burning heater, and the burner is compact, easy to operate

and clean.



An oil-burning beater, mounted on a small track beats the prich for routing

C. POPULAR SETENCE MONTHLY

Portable Steam Radiator Heated by Electricity

N ELECTRIC steam radiator is one of the latest developments in modern heating for the home.

The heating element extends throughout the radiater in a protective seamless betube, which assures an e ken heat in every column and rovides a large radiating surface for heating the water surrounding it

Water is supplied through a filer cap in surficient quantity to edver the heating element and current is applied by turning

the switch to "High" for bringing the water to the steaming point, after which it can be turned to "Medium" or "Low,"



Radiator can be used note may emitted

w rays in which the ordinary incantescent lamp is rich, but that are not present in such abundance in sunlight.

and dye industries

NO LONGER need a sales-

window to show a prospective

customer the effect in day-

light; nor need he even turn

on a special light. Instead, he

soon will be able to hand the

customer a pair on daylight

spectagies, invented by Dr. Hawdann Weys of Vienna.

Appendy the ricotholes inve-dome into widering in labora-tories in the textile, paper,

These daylight spectacles

man take material to the

### Safety Butt-Hook for Logs Prevents Accidents

EVERE accidents sometimes occur Iumbering camps when logs fungation up steep halades become a o A cidentally from the lines to diag hard Too, recovering the log, many great lost of time.

A safety butthoon recently invented provents this sendents uhmooking Press-

ing a thumb latch opens a plunger sufficiently to allow the line passing around a log to be placed within the book. The plunger then drops back to a closed position and the book As locked automaterally by a spring that forces the latch back to its original position.

Have you entered our remarkable

\$10,000 Contest?

See page 29 of this issue of

POPULAR SCIENCE MONTHLY

### Improved Metal-Cutting Tool

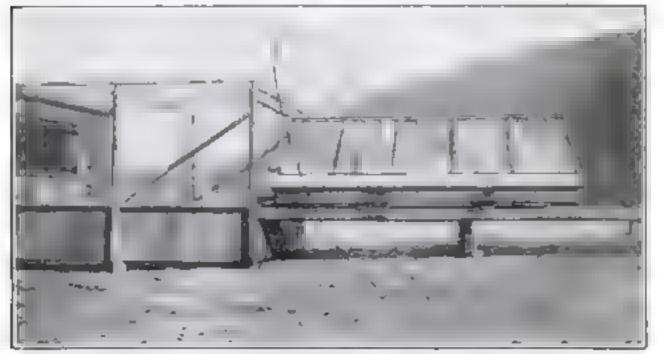
NEW tool that cuts metal at higher practicable with standary tools was dechange Engineers by as preenter, Dr. Hand Kapatock of Berlin, Germany Tests hade in foreign railroad shops, Doctor Woostock claimed, indicate that production can be increased about 80 per cent by the new too

### Man Builds Sun Parlor for His Chickens

IN ORDER to take full advantage of ultra-violet light, which experiments have shown to have a decided benefitial effect on egg production, H. D. Goddale, of Williamstown, Mass., has constructed for his chickens a unique aud porch. glass roof travels smoothly of a track and when the sun shines, the good is slid out so

that the hens can get the full benefit of the ultra-wolet or health-giving rays of dunahine.

When it a cloudy or raining, the glass out is used for protection from the weather, and mercury-are electric-light lamps are used to provide the bens with artificial sunshine.



How the aun-porch extension is built on an ordinary chicken-house

### Shoemaker's Last Distributes Hammer Blows Evenly



THE shoemaker's last shown above is intended especially for the lather of a large family who finds that the only way to keep his clildren well-shod is to mend their shoes nimielf, but a professional shoem nde, too, will find that it has the anvahlaged.

alt donaists of two parts—the last itself over which the shoe is placed, and the support, with its wide, curved base that fits/comfortably over the shoe-mender's knee and, by reason of its size and shape, distributes the shock of the hammer blows so that they cause no discomfort to the operator. One other improvement is the insertion of a rubber disk between the last and its base.

### New Railroad-Crossing Guard

A SWEDISH engineer, A. Westfelt, recent invented a Meguard for railroad crossings. It compats of a bar, seven feet high, that aving that whenever a train approaches and short chains that strike any car passing underneath. The bar gives a driver warning 80 feet from the track. It is operated automatically by approaching trains.



### Smoothness of Illinois Roads Tested by Profilometer

IN THIS day of the automobile and the heavy truck, roadmaking him an Important place in state and town business. It is important to find what meterials and system of construction withstand best the wear and tear of focal conditions.

It is for this purpose that Illinois employs the 32-wheel profilemeter, illustrated above. It is a most ingen)our series. The 32 wheels are controlled from a steering-wheel sectors of center, by a straighted able that is connected with tach wheel and crosses it center thus riving an even pull on a the 32 wheels A recording instrument, called the "etrainagraph," indicates on a record sheet every unevenness in the nawly made road,

in fact, the needle actually records the exact profile of a road, from crown to sides, including curves and grades. This machine enables the state to keep tabs on tts road contractors.

FINE dust from chimnels will, in the near future, find some commercial one in the industries either as filer or paint fertilizer, or other products, or as a base

Much work now is being done to develop methods of catching the fine purticles which fly up the chimney with the

### Predicts Uses for Smoke

for some building material, according to Prof. A G. Christie of Johns Hopkins University

flue gases, he pointed out,

### Know Your Car

A STARTLINGLY large amount of the gasoline that is poured into auto tanks is wasted through improper carburetor adjustment and careless methods of driving. Another large amount is wasted yearly through small leaks in the carburetor and gasoline piping. A tiny leak, just sufficient to keep the bottom of the carburetor covered with a film of gasoline, is often enough to drain the vacuum tank dry in less than a week if the car is standing idle.

Remember these rules if you want the maximum gasoline mileage:

1-Never adjust the carburetor when the motor is cold. Change the setting only after the motor is heated up thoroughly.

2-Keep the mixture as lean as possible without noticeable loss of power.

3-Never race the engine while idle and avoid jamming the throttle wide open unless it is absolutely

necessary

4—Coast long bills with the motor shut off entirely.

5-Do not use the brake except in emergencies. Learn to shut off the power and coast to a stop with just a touch of the brake for the last few feet.



FROM ENG. parking us I bon was f . regitally fraction, thick itrotchil . A stude woulde partitions are threaded on the from Each legg is placed carefully between the four cords and there held securely. This is said to reduce breakage.

GAS-FIRED auto cleaner, the inven-

tion of Garnet McKee of Rockford,

### Coal Sizes Standardized

HOUSEHOLDERS will be glad to hear that beginning this way the anthrothat, beginning this year, the anthracite coal industry with standardise coal sizes. Elaborate systems of acreening are being lightailed at the anthrecita mines Stove foul for the litter prange will drop through holess exactly 244 inches in diameter, and purt coul for the furnace through meniage one and nine-sixteenths inches in Tameter

Slate mixed with the coal will not exceed in weight from 2 to 714 per cent of

the delivery.

### Camera Photographs Stomach

AN INGENIOUS camera that photographs the interior of the stomach was displayed recently at Atlantic City, N. J. The apparatus consists of a metal tube that can be slipped light the patient's windpiped. At one and of the tube is a powerful electric light that illumines the stomen, and at the other and a special camers, with a series of lenses in between. The apparatus operates like a periscope, enabling the doctor to get a clear view of the patient's stomach.

### Gas Auto Cleaner Uses Fine or Heavy Spray

III., is the newest device for automobile washing and removing paint or grease. It consults of a small steam-boder, a container for the cleaning chemical. and a metal nozzle with two lengths of hose, one far carrying a highpressure supply of steam; the of for delivering 4 special cleaning compound from the container

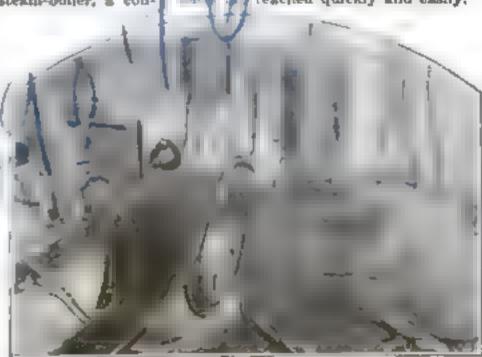
power is turned on. When cleaning only is desired, a weak solution under low pressure used.

The compound is

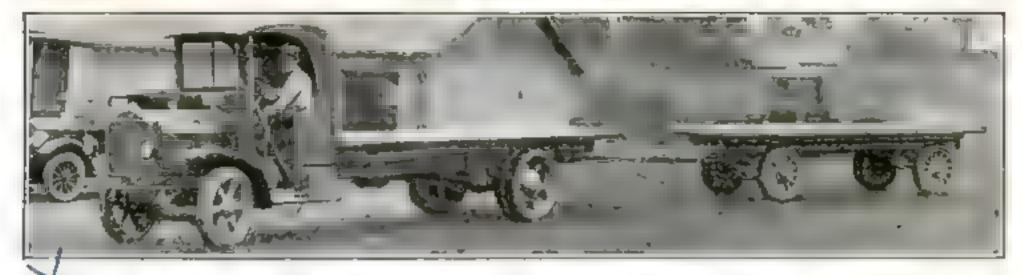
mixed with steam

in the norrie when

paint or greate is to be removed, fulls reacth solution is said to remove all matter almost instantly in inaccessible or complicated ---- reached quickly and easily,



Removing grame from a car with new steam-pressure Apparatus



### Trailer Brake Is Controlled from Cab of Motor-Truck

BRAKE that is said to give complete mechanical control of the trailer from the cab of the truck has just been developed by a Los Angeles trailermanufacturing company

The new traner brake is in two unitsone installed in or alongside the cab, and the other on the trailer frame, just behind the front axle. The two units have s cable connection for setting and releasing the trader brakes. This cable connection can be disengaged between the truck and the trailer by means of snaps, thus per-

### Motion-Picture Cameras Now Operated by Radio

MOTION-PICTURE cameras have been operated successfully by radio. according to reports from Universal City, California. A special device enables a camera to be placed at a point far distant from the operator and actuated by a Leanumitter/

This is experted to be of great value in photographica long landscape acenes novie outtles, for example, where several ameras have to be worked at the same time from different positions.

Another new use for radio is in overcoming the fog menace on the Great Lakes. Seven stations on the takes will be fitted with radio equipment that will send out warnings.

mutting the use of the truck alone or with another trailer, and the use of the trailer with another truck

To get the trailer brakes, the driver operates a hand leves closely resembling the band brake on the truck. By pressing down with his thumb in the push rbd. he engages a dog in the ratchet on the drum, making the hand-lever brake integral with the drum Then, by pu mg

Removable Truck Floor Permits Economical Replacement



N LUADING pocks and setter hears makeriale, the intract on truck flows often not only teaves premanted inden ations, but creates presing that in time distant the entere truck body. Proors of heavy-armor plate regist the shocks, but back on the hand lever, he winds the carble farther around the drum and thus

with the control the driver can alternate in the use of truck and trailer brakes on a long down grade, and as there is no need of running against low-gear compression as a means of braking, there is possible a distinct increase in the speed of transportation

the expense and weight of material of this thickness are too great.

A manufacturer recently constructed a removable floor for trucks that is said to have great resiliency, and prevent trucks from being damaged. A layer of heavy creesoted planking is laid on top of the original steel floor. On top of this there is a protective covering of steel plate. The whole is bound together by flatbeaded bolts.

### New Method for Reviving Asphyxiation Victims

AN INHALATOR device for administrative work by Dis. Yandell Venderson and tering to victims of suphysists mixture flowars W Haggard.

The new device differ from sther recent; COas per cent) called "carloger, suscitating device in that natural beauthis the result of much study and research tog is brought about by the use of carbon

toxic substances.

Reviving an asphysia victim with the newly invented apparatus

dibuide, which is Nature's own means of stimulating breathing. Oxygen, when administered with a small amount of carbon diaxide. causes the patient to breathe more deeply and rapidly, thus consuming large umounts of exygen, that flush from the blood any volatile

It is claimed that the inhalator gives the patient every chance of recovery without danger of poeumonia,

### How Much Do YOU Know about Science?

THE following 12 questions, each relating to some fundamental fact of science, were selected from hundreds of queries sent in by the readers of POPULAR SCIENCE MONTHLY, How many of them can you answer correctly?

Turn to page 116 and see how nearly you were right.

I. Why is it poor policy to cover the ice in the refrigerator with paper?

2. What is the highest temperature a person can stand?

3. Why can people who ap-parently have been drowned be revived by artificial respiration?

4. How can a but fly in the dark without hitting anything? 5. Why does the moon seem to follow you if you watch it while

you are walking? 6. What makes ocean cur-

7. Why do colored clothes sometimes fade in the sunlight?

6. How are electric signs worked that are made up of moving lights?

9. Why must the ground wire of a radio set be fastened to the water-pipe rather than to the gas-pipes?

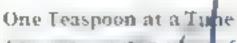
18. Why do some flowers close up at night?

11. What does fear do to your liver?

12. Why is yawning catching?

### New Household Aids for

Improvements in Laundry, Kitchen,







### Speedy Cookie-Cutter

in spite of its simple shipe the double or her shown to ve to depth to raise. The eather to a star any fits agers any fits cookies a minute. The blades are made detachable

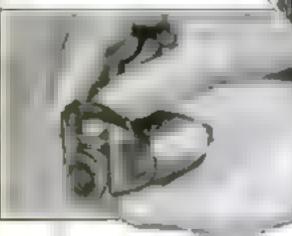
### Iceless Refrigerator

And the party of the spirit of the second of



### A Compact Laundr

For apartments where space is limited. I laddley fourth that can be attached to an ordinary suit has been devised. All the applements necessary for washing could a are arranged on a partly, heady for one. The clothes are hung on reasts by



### Spring Bottle-Cap

Once this cap is added to be t



### Portable Dishwasher

The property parce



### Flectrically Heated Cup

Shown above the constant of the total that will appear best with a section of the section of the section of the total that the section of the total that the section of the

### Nine Tools in Ope

Thus ton will, pull there is all the select 


### the Modern Housewife

and Bathroom Make a Shining Home



electric oven it me on a dracket to that it can be a decided to the boundary, and to there is no trouble in the property of the boundary, and to there is no trouble in the property it clean



### Adjustable Shelves

By means of the fix turns above, above, shell himckets can be those on half meh interval. A ground thodate utenails of different heights

### A Folding Bathtub

ing bathroom, lilustation at center and attempt at center and attempt at center and condensate the second at the s



### Shoeblack Stand

Compare and complete, the most lattle shor-problems rack will not look tenismen bedroom or bathroom. The extension can be adjusted by two heights and bey less a unjustiment in brushes the gare reless or the proshing rag to run tarough



Every one has had trouble spendig time such an contain shoe point?
The opened shows above is used to plooning one of the flanged couperficate of the flanged couperficate of the flanged couperfication, and the time pens came your will set bending its edge

### Folding Ironing-Mourd and Sent

I festrate i below and in two actores at hight don thoming bears with a seat a tacked, both of which will fold hip into comparatively small shade. This top the board is at his top the board is at his top a tack in place by a turn of a thumbersw



### New-Style Hand Brush

in the part re above is shown a reconstruction and scrubbing Brush. Be note the unid a resulting there is an independent and made appearably for scrubbing the fingers individually Nails are pleasased by ribbing them best and forth over the brush







### Shoe with Hollow Heel Holds Handy Powder-Box

USE of the beels of women's sloes to carry small articles, such as latch-keys, pins, and ever small change, is not entire, you new uses. But now there comes from Lordon an odd new type of those with a hollow neel that serves as a nowder box. Whenever the wearer wishes to powder box beel swings down on a lunge, giving access to the puff, as shown in the illustration at the right

If you treat fish ponds as pastures and fertuize them, you will catch more fish A legister at this University of Munich, Dai H. Fischer gives the advice, based on recent experiments. He obtained the best results by using phosphate fertilizers. When potash salts were used, it was found by the investigators that the increase of fish was not so great.



The hollow heel swings downwood on a hunge, giving necess to the powder-puff

### Family without Fingernails Discovered in Italy

A FINGER- and toe-nail-less family of women was discovered recently by the scientist, J. A. Pires de Lima. For three generations no woman in the family has had a full-fledged finger- or toe-nail. The investigations of de Lima show that in every other way the women are normal and healthy. Their seven brothers have fall sets of healthy nails.

hrothers have fall sets of healthy nails.

Di three first-cambless daughters, one has been married and produced daughters who are also trubeut lingur or toe-nails. Hoctor de Lima has reached the conclusion that this peculiar condition of the finger-nails is transmitted from mother to daughter as a result of an unusual case of sex-laked

### Novel Cigar-Lighter Made like a Telephone



A NOVEL cigarlighter, inty Sidney
y of Herschool, ill., is made
to remarable a teleph. The retime a gas
When this
a lifted from the
hook, a salve is
opened cleaning a
flow of gas that
gentes dutomaticaty

made in the shape of a deak telephone, as well so the wall style

### Steamer Built to Submerge

I OW bridges that span the River Spree in Germany interfere with the passage of excursion stanners from Berlin. Her that reason it is reported, a new steamer to carry 1000 seasengers will be equipped with firese tanks which, when itsed with water, will submerge the hull sufficiently to pass under the lowest bridge in the river

### Four Veterans See the World in Auto Home

AN INTERESTING round the world motor trip that began, in 1921, was

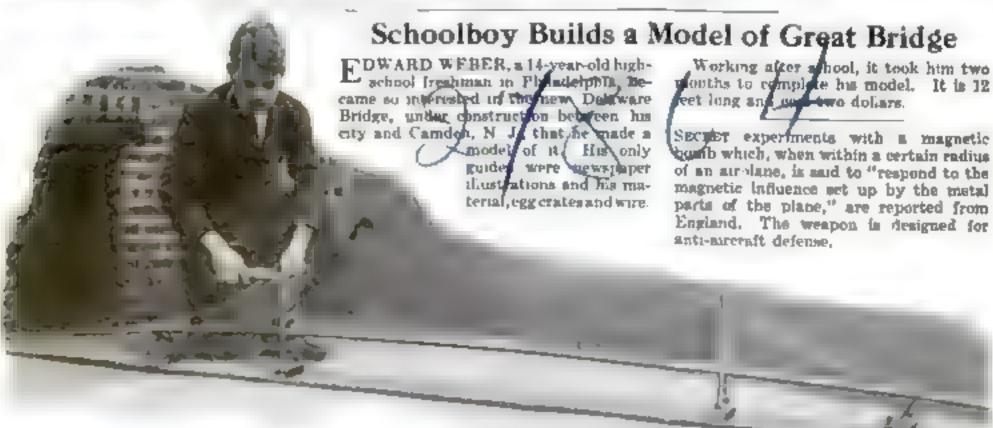
Odd round-the-world car, plastered with sourceles

Edward Weber 14-year-old Philadelphia boy putting the facebang touches on his remarkable model of the new Philadelphia - Camden bridge

On a Ford change n small, houselike the world on a Ford change n small, houselike the forest for the tourists. As they from piace to place, the four tacked license plates, posters,

coins, stamps, and other souvenirs on the walls and roof of their conveyance. These bear evidence of the out-of-the-way places they have visited. The car has penetrated practically every civilized country in the world.

The ex-vervice men passed through New York on their way to the New England states and to Boston, where the car will be placed on exhibition for two years and then sent to the Free Museum at Washington, D. C., as a memorial to the disabled veterans of the World War



### Fire Extinguisher Saves Pilot Five Miles Up

EFFECTIVE use of a fire extinguishing device nearly five miles up to the air recently saved the life of Capta of Luzht, a French altitude-record toker, when his plane caught fire.

When Captain Clause saw flames bursting rom the Bood, he seized an extinguisher and sprayed them until the fire was out. Hater, in making a forced landing, flames again burst out and he had barely time to jump into the branches of a tree before his seat in the cockpit was enveloped in fire.

### Harbor Telephone Station Used by Rum-Chasers

Atlantic Coast the telephone, as wenter wireless, has proved an important means of communication between abvernment coastguard boots and officers on land. The picture pelowishows a revelent of telephone station—a phone points on the water—incently placed in Roston Hapbor for up by superchasers. Its number is kept confidential.

The tentihons instruments are inclosed in a small box fastened to the end of a log marker in the water. From the marker a cable runs under water to shore. When



Pressing the levers of this vanding ma-

### Machine Prints Names on the Pencils It Sells

BORROWED pencil after fails to bed its way back to the original owner. To make destinuation sure, and at the same time providers handy means of purchase, a new vending trachine has been designed to sell pendin starmed with one's full name.

by pressing various levers on the machine the purchaser sets his name up, letter by letter. The name can be checked for errors before turning the lever that prints it on the pencil. The machine holds about 300 pencils.

While we are interested in the excavation of ancient cities in Egypt and far places of the world, we are indust some at home. The other day, C. Chaprove, an American archaelogist, dispoved a buried indust value on a ranch near Three Rivers N. M. Two perfect rooms have been excavated so far. Skeletons were found in the smaller room.

### Dentist's Traveling Office Serves Schools

TO PROVIDE expert dental service in rural districts, where otherwise is might not be available, a destal ambiguates with skilled nontist and name a operated by the New Arrays Board of Health at the complete equip-

of files in a the New Array Bload of files in a the complete equipment the dentist's trave ing office pulls up to the door-steps of rural schoolhouses, where it is awaited by willing patients.

### Black Tanks Waste Oil

BLACK cows are hotter than white cows. At least it seems so if one places his hand first upon the black then the white areas of a spotted cow standing in the sun. Recent tests have proved that the same thing is true of black-painted and swhite-changes of table, and important use of the effective is being made in the petroleum business to prevent the evaporation loss of stored crude off. In recent tests it was found that a tank painted aluminum or

white, rose in temperature only 19 to 22



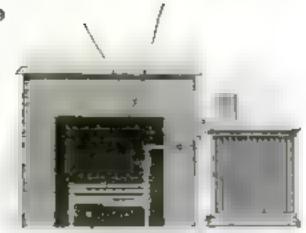
The traveling dentist in his office

degrees and lost only nine per cent of its naphtha content. If it was painted black, it increased in temperature by 54 degrees.

# the officer of a boat wishes to communicate with the shore, he simply runs his hoat up to the log and puts in his call to the Boston Central.



Twenty-four army mules are shown here winning a tog-of-war against a beavy army truck at Crissy Field, Sun Francisco, Calif



### How to Install a Hot-Water Heater in Fireplace

WICE as much useful heat is said so be obtained from a fireplace with the installation of an ingenious system in which the fire is used to hart water lipes. It is the invention of Makin Dange, a former member of Congress

The ordinary grate of the fireplace is replaced by a basket made of non or steel water-pipes, in the form of a square cost, with an intake pipe at the bottom and an outlet pipe at the up. The outlet pipe leads to a steam radiater, located wherever it suits the convenience of the user. The pipe is connected at the top of the radiator From the bottom of the radiatur an out the tope leads to the intake of the fire basket

At a level slightly above that of the top of the radiator, and connected with its intake pipe, is a water-tank. This, when filled, serven as an automatic pressure regulator

When the the materied in the backet in the freplace, the water in the pipes is heated and rules, passing into the radiator and through a back to the bottom of the fire basiget. Small quantities of water are added ofcasionally to make up for evaporation in the pressure tank

Nothing is required to build this bester that is not found in an ordinary hardware store, the inventor says. The pipes and elbows are of stock sizes. Radiators of mny mise can be used and an ordinary bucket for the pressure tank.

### Selenium Protects Insulated Wires from Flames

DURING recent laboratory investigations at Cambridge, Mass.4 to find new ways to make insulated electric wires flameproof, it was discovered that sele-

num had great vidue in provening the spread of fire alout the interaction. It was found that the pure by weight of selenium protects at pures of cotten braid and 10 paint of tubber covering in the presence of 10 perts of copper conductor, contained in the usual No. 22 switch-board wire. Three pulligrams of selenium this partect a centimeter of learth of wire. thus protect a centimeter of length of wire, or one-pourd projects nearly a mile of wire.

On application of a flame, it was found, much difficulty is experienced in getting the insulation to ignite at all. When ignited, however, and the igniting flame is removed, the flame usually goes out without appreciable spreading.

The experiments were conducted in the laboratories of Arthur D. Lattle, Inc., in behalf of a wire and cable company.



### This Device Turns Boiler into Washing-Machine

O CONVERT a mahboller into a washing-machine, an ingervous de-vice consetting of two meight extenders on a base, and fitting into the bottom of any washbotten recently has been invented Bach cylinder has 32 holes out of which soapy water spouts when the water is boland and steam is generated. Its action is product to that of a coffee percolator

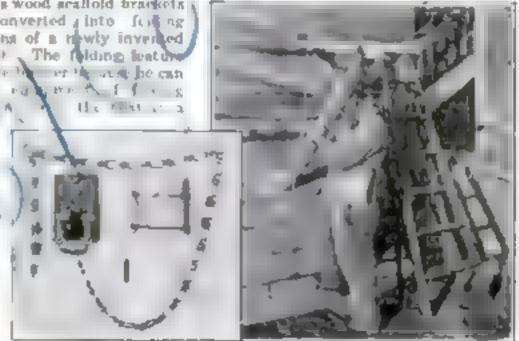
The scapy water forced through the haves flushes the dirt out of the clothes

### Folding Scaffold Brackets Aid Carpenters

INY carpenter's wood acaffold brackets may be converted a into fed ag brackets by means of a newly invented A resortant a to be or the acid be can man at treet by the till a Property (F. ID # A angle back grown store them yn space hot much largershan that newlight Vior a

The parts of the attackment ronmst of a steel angie, # /loosehinged dévice, a length of light. strong chain. and a lock

of sharety

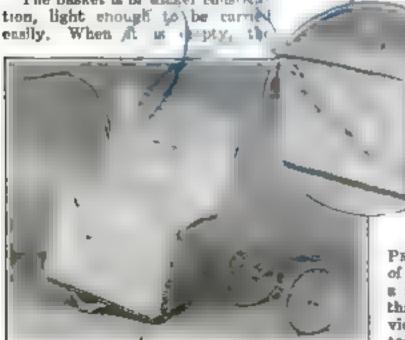


Folding scaffold bracket and Jeft) parts of which it is made

### Now Tired Shoppers Can Wheel Their Bundles

O RELIEVE women shoppers of the 1 bother of carrying hundles, a French inventor has designed a shopping basket which, when filled, can be wheated, like t haby-carriage.

The basket is of wacker construct



How the banket is transformed into a carriage

wheels of the carping fit inside the basket and the handle say gs down over the set a A grap a serveded at the top. When it is to be filled with bundles, the

heels are removed and the handles swung back. Then the wheel axle is fitted and locked in brackets that are lowered at the bottom The lid is locked down by the insertion of a pan through projecting loops, and the shopper is ready to wheel ber purchases home.

> PROFESSOR VLADMIR KARAPETOFF. of Cornell University, has invented a five-struged musical instrument that has the combined range of violin and 'cello. A fine depth of tone and shading are possible on this instrument, it is said.

### Pure Silver Aluminum Made by New Process

PURE aluminum, the goal of many years of research, soon will be available in commercial quantities through the development of a new refining process. The term, "pure aluminum," is, of course, still a relative one, but its use certainly now is justified because the new process makes this metal with less than two onehundredths of one per cent of impurity.

Previously, the purest aluminum ordinarrly available cost a ned 19 7 per cent of this metal. Home of the new product is as pure as 99 981. The principal impurity is copper, but traces of iron and allicon also are present

Melfed sale of lodium, aluminum, and The impore molten aluminum is carried by the dectric current upward through the motion layer of these salts and is separated on top in a molten form from which point it can be poured or ladled off into molds.

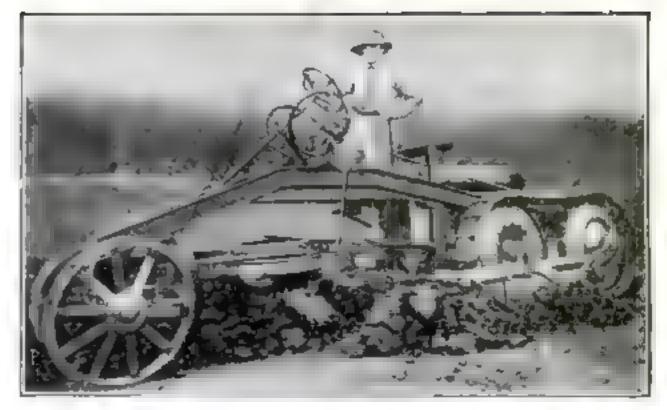
This pure aluminum has a beautiful silver color and luster which it is said to retain very well

### New Crawler Attachment Adds to Tractor Usefulnes

NEW grawler-tread attackment for tractors is said to permit the use of the machines under most lafficial condi-tions in sand, marshy low ands, vineyards, orchards, and over rough, uneven ground. In or fields, where one fraction is unusually treacherous, this is urbment, which greatly increases the ground con-

tact, is reported to be especially useful. The operations of the drawler attachment is independent of the tractor differential, Control is Jobtained through the use of two independently operating multiple valuelatines, one in each driving aprocket. This type of construction permuts the ful, lower of the engine to be applied to dilving the track without imposing any strain on the tractor differential, which is locked.

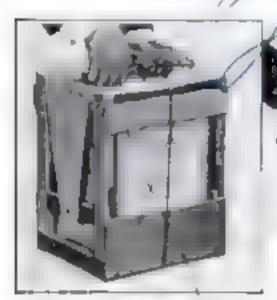
The attachment provides a tractive surface of from 900 to 1000 square inches.



Tractor with the new grawler attachment being operated on a plantation in Gula,

Oil Pouring Is Simplified by Tilting Crate

OR five-gallon cans a new tilting crate and a device to permit oil or giver liquids which the date on swing When the liquid to be poured from the can wilkly dt lifting it.



How the cover of the crutd serves ee a support for tilting the can

The cover of the cratters designed with

b be pourd, the contents e and u made to rest on t feac supports and tuted

When the can fitting in the crate is equipped with a specially designeds wivel spout, oil can be poured in small or large quantities with a minimum of waste and without sothing bands or clothing.

When used as a shipping case, the base is awang around to serve as a cover for the can

### First New Comet of the Year Discovered by Accident

CHAJN'S comet, the first to be dis-O covered in 1925, which was picked up at the Simeia Observatory in the Crimea, Russia, was found as a result of a mustake in operating the telescopis. This is revealed by Dr. Otto Struct of the Yerkes Observatory, who just has rade ved a detailed account of the every virtin G. Shajn, the discoverer, with white the formerly was associated at the Pulkovo Observatory, near Lephague tory, mar Lenlingrad

In making a trial exposure with a photographica telescope that must be kept pointed at the object desired to be photo-graphed. Mr. Shajn moved the instrument the brung way. This happened to be the direction and speed with which the comet was moving, so when the plate was developed, the comet was detected

If the telescope had been guided properly, the comet would not have been noticeably different from the stars.

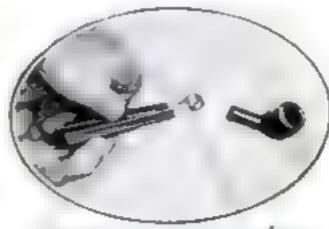
### Ingenious New Ice-Box Makes Cold Out of Heat

N ARTIFICIAL ice-box that is said to operate like a coffee percolator and to generate cold from heat has been invented by two young Swedish engineers, Carl Munters and Bloxar von Platen. When heated at one parts, other by gas, electricity, or kerosene in code the usual kind of food-chest and for ordinary house-hold purposes needs to be run only a few hours a day. When operated with gas at the Stockholm prices. It is said to produce

the equivalent effect of eight pounds of ice at the cost of one cunt.

The ice-chest has no movable mechanical parts. Operation is initiated by heat that sets an amounds solution in motion in a small foller. The ammonia then passes through condensation tubes. While tricking down a generator, it mixes with hydrogen and by evaporating absorbs enough heat to cool the food.

In a third cylinder, the ammunia is washed free from the hydrogen and then percolates through a set of tubes into the boiler again, where the heat once more sets it in motion. While this action is kept up, the refrigeration process continues.



Split Pipe Stem Can Be Taken Apart for Cleaning

WITH a stem that is split to taken, this to vel pipe can be taken spart easily for cleaning / The two takes are held tightly together by a decorative metal band that screws on a threaded part is the stem nearer the bowl. The eym to be leakprouf

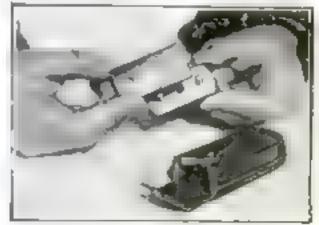
THE new 16-mch guns/town peing placed at the Parama Capal can about a projec-tile weighing more hap one on a destance of 27 miles once every 10 seconds.

### Magnetic Case Designed to Sharpen Razor Blades

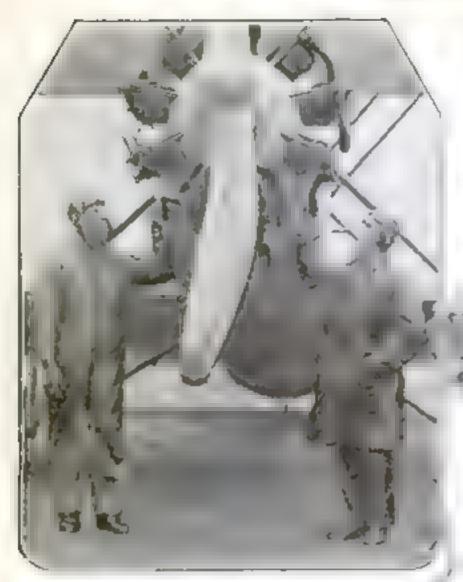
CONTAINED in a small men of pottet are, an unusual magnetic device in said to sharpen safety-razor hunder by straightening the blades' eggs. A blade fits between owo pieres wood and is supped into the case which has sides of highly magnetized metal

f metal, it is claimed, pulls the edges The blade straight through attraction. Sharpening is done by leaving the blade in the case. If left there between shaves, the blade always will be ready for use, the

invertor asserts



Inserting rasor in magnitic sharpener



## Spectacular New

Mammoth Passenger Planes — Broncho Buster—Other

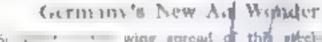


### New Air-Cooled Motor

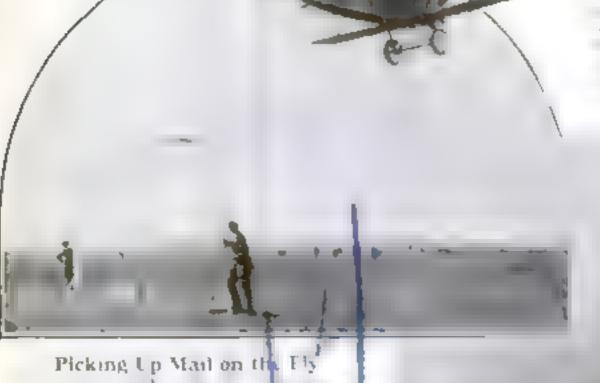
Driven aby a new street

Because of the base of the bas





So, wing opens of this speciaribled on that 60 men and and by



This pacture shows how/one of Gen in most /planes pain up to stopping. The in and tipe palot, lying a crops of one of hot carches the

#### The First Aerial Cowboy

"Let 'er buck!" welled Bub Rose when, in Los Angeles recently the strapped his open pony saddle to the back of appointplant and tung of while his acrist seed that the the parties.





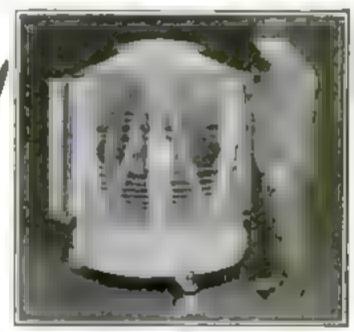
A Flying Ambulance—Aerial Oddities of the Skies



### Remarkable Rotor Propeller for Airplanes

Fifty-per-cent increase in pulling power is claimed for an unusual new rotor propeller for simplanes designed on somewhat the same principle as the Flettner rotor sailing ship





### Airplane Ambulance

hubited of France has additioned the selection of the selection of the selection of the selection of the ambulance stretcher

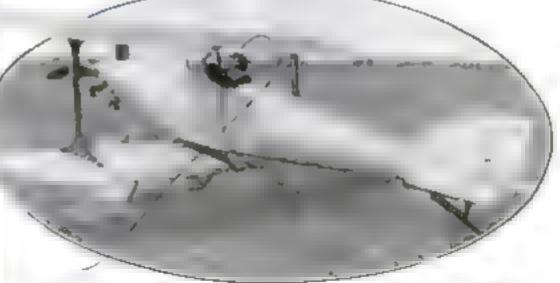


Light radiates in all directions from this huge searchight, imported from France for use on the air mail landing field at Cleveland, Ohio. It illuminates an area within a radius of three-quarters of a mile



Nobody Was Hurt

A French pilot not long ago actidentally landed on the roof of the plane's hangar near Paris, with the startling result pactured at the left



#### Garage-Sized Biplane

in a text at Lincoln Nob., this baby biplane is reported to have the veidt 100 miles and hour. It while only 350 pounds and his to a mage

### Automatic Post-Office also a Telephone Booth

AN AUTOMATIC post-office that supplies stamps, receives letters, and provides telephone service, all without the assistance of an attendant, has just been built by the British postal aithorities at St. Martin'a-le-Grand, London, not far from the General Post Office. It is an experimental structure entended for erection at Bath, Somerset and other stations as a substitute for remporarly ciosed postal offices if the new post-office kross proves a success, similar structures may be installed in busy streets

The Phak is about nine feet high and 3 % feet wide. I he inside is designed as a soundproof temphone booth. The letter box is fullt into the back of the know with above a are the stamp machines. At wight the automatic post-office is illufrinated by an electric lamp and the signs, "Post - Office," "Stamps," and "Tele-

phone," also are illuminated



The post-office and telephone booth

### Periscope to Protect Bank Vault from Bandits



AS A protection against bandits, a back at Portland, Me., recently fitted its safety vault with a periscope through which a police man on his rounds is enaited 1 view the interior of the vault from the outside of the bank building

The periscope, consisting of an optical system of prisms and lenses, in concealed inside the vault, and

has an outlet or peephole set in the stone facing of the humaing. By this means any -e approaching the doors of the vau t intent on robbery can be obserued by an afficer from the outside of the building where vault is natailed A · elected to the transfer to the a J. h b a e a

Will and the first terms of



The periscope apparetue in bank vanik deft and the peophole outlet in front or effect well of bank



### Compact Curling-Iron Fits in Vanity Case

THERE always seems to be room for just one more accessory into woman's vanity case; and so she undoubtedly will find room for one of the latest novelties—a handy little curling-irely. It will fit into a case less from 4 to inches long.

The new colling fron is contained in a telescoping metal tube which, when exwhen the burner is lighted, as shown above the flame heats the metal of the iron which must not be allowed to get too hot at it is harmful for the user's hair and the fron theelf

#### Bacteria in Hailatones

VER since the discovery, a few L years ago, that fog and rain are caused by the condensation of water vapor around nuclei consisting of small particles of mineral or organic matter that had been carried by warm air currents to great beights, R. Dubois, a noted physiologist of Lyons, France, devoted conuderable study to this subject. With great care and infinite patience he colfected droplets of fog and rain, crystals of snow and hadstones, and submitted them to a microscopic examination.

in most cases Mr. Duboss found that the nuclei of condensation consisted of extremely fine particles of organic or mineral matter volcanic ash, pollen of condicts and their plants. Particularly interesting is the fact that recently he duckered that in many cases hadatones werel formed by condensation of water vapor around microorganisms of a type resembling that of certain phosphorescent bacteria. Among them was found a microorganism beretofore unknown, which he named Bacillus grandiasum. bacterium resembles in form that of a shoe sole and its color is a delicate red or rose

#### "Mechanical Brains" Do Algebra

TWO different types of "mechanical brains" machines that perform the most complicated mathematical problems autoperform the most complicated mathematical problems automatically -recently have been perfected separately by two young inventors, Frank P. Gage of Biston, Mass. and Stuart

C. Dodd, a graduate student in Princeton I niversity. Both are expected to prove of great implicative in psychological and educational research, and in industrial test streat work.

The Gage invention has aroused known therest among students and professors at the Massachusetta Insurate of Technology, where it has been tested. The uncenter cosins his device has the mechanical ability to solve within an hour a mathematical problem that ordinarily takes three or four days to solve.

Dodd's intention is known as a correlation machine, designed to-indicate how much one set of facts is the cause of or is related to, another set. It solves quickly the most difficult problems of algebra. It is said to be so constructed that by its use insurance companies can determine a man's expectancy of life by comparing his physical ailments and habits with the average for other men in his class,



Frank P Gage (left) with Herbert & Stewart, working on machine



### Draftsman's Fountain Per Is Made Adjustable

FOR the use of draftsmen, machanical engineers, and professional men, a new fountain drawing-pen has been devised. As with the ordinary drawing-pen, it can be regulated to give any stroke, from a hair line to a bild line, and as it works on the ordin principle as the fountain pen, it can be carried conveniently in the pocket.

### Derelict Ship Wanders Seas for More than Two Years

DRIFTING about on the Atlantic Ocean, the dread of hundreds of skippers, is a ship like the Flying Dutchman, without crew or sails. For nearly two years she has been wandering without guidance. A. B. McManus, of the Hydrographic Office of the U.S. Navy, believes that she now is headed toward the Sargasso, Sea.

The ship sailed in September, 1923, from Neva Scotia for Brazil, with a cargo of luncopr. A severe storm came, damaging her severely. The onew was rescued and the ship attandanced.

The lumber came keeps her shoat. Once the was opported on him by a vessel that highest her, but when seen again the fire was out. Once a constguard cutter took her in tow, but struck a gale and she was again a wanderer.

No one knows where the derelict is now, which makes her very dangerous to others.

A BRONZE tablet has been placed in Menio Park, N J., on the spot where Thomas Edwon perfected the electric light, the phonograph, and the interior picture machine. The inteription reads, "On this site 1876-1862 Thomas Edwon began his work for service for the world to illuminate the path of progress and lighten the labor of mankind."

### Dispensing Machine Makes Paper Drinking-Cups

OU manufacture your own paper cup as you turn the crank of a new dispensing machine, pictured at the right. In the same operation the completed cup drops into a receptable, ready for use. America uses forth million paper cups a day, and this recent invention was designed to but down the cost of making them

I roll white paper fits in the machine A simple mechanism shapes the cup and makes it water-tight without the use of pasts or glue.

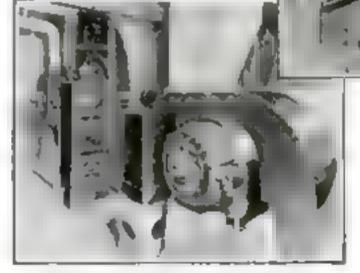
Cologne, Germany, and towers all of nineteen stores bigh While Europeans say that it is an Apperiran, model, American, between denytate resemblance. It is in heart red brick, with no ornamentation and it said to look like some medieval cautia pather than like one of our own efficient looking office buildings.



\* Pressing a lever forms cop

### Fresh Air for Every London Councilman

A LNUSUAL system of are vantilation installed in the London Court four cil Hall in London, has at a makes it sopubled for each member of the four to from his deak, the had two of the ar erab limble secompatched by an arrangement of supply and extraction openings



Mactionry for conditioning the sir Above View of council half, showing addividual ventilators

placed so that by manipulation of a rever beneath the desk the occupant can direct the flow of air upon himself or upward into the general atmosphere. Thus the air of the chamber constantly is being removed and removed. The entering air is beated and conditioning the air is situated under the Council Chamber.



Course Schickerling, with three types of his filementiess balbs

### Light Bulbs without Filaments

THROUGH the invention of an electric-light bulb that requires no filament, Conrad Schickerling of Newark, N J., claims that municipal lighting bills may be cut in half A 500-watt lamp of the new type, he says, will burn twice as long as filament lamps and consume less than half the current now required,

The inventor also has made lamps of two-watt fize for use on signs. These, he declares, will reduce the cost of current to 20 per tend of us present level. Auto lamps of two contilepower and higher, without filaments, also have then tender. An advantage commod for these is that jarring will not propose break them.

Spil another invention of Schickerling is a vacuum tube withthe filament of grid, designed especially for alternating-current produce perfect rectification, devoid of all alternating-current hum and nows.

In the photograph the inventor is seen holding in his hand one of the new radio tubes. On the table are a large electric-light-bulb of 500 watts and a smaller one for use on signs.

# How to Construct a Compact

Fig. 5. This picture above. the extreme comportness in he wo take receives weight only bree pount a and can be deld in he pain of one hand

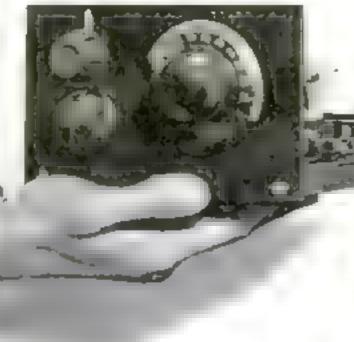


Fig. 3: Stone view of the re to subt record An puris are eitered into numbered to a respond the stallparts to fining on he was a regard

Ille were pertal as a predit radio real very seasoners to have many meanings. At most of the scale we have nortable radio sets that are thosed at and a it as eas years heavily loaded trunk. At the other we have sets to turning the tity siles as as he thingled a new a maker a second at

The two-tibe president was a bore ar proper on neither extreme. It is simple a g as two-tube unit built of standard parts and made as compact as possible.

Every radio (an han liss own dean as 🏗 how to make up a portable out it, and so peveral aketehes are shown of the pages that will help you to decide of an ar-rangement heat suit a to your owe particular needs.

The set ourrates with two three volts dry-cell vacuum to make da plate voltage of 46. It is want in the tore, to run be not using two standard C outtories parallel for the A-batter party - 3, and two

COMPARTMENT FOR HEAD AND ANTENNA W

Fig. 3-Here is a suggested method of fitting the set into a portable case. This idea can be modified easily to suit your own particular needs

of the small Highestern gurren The bear of result as we with a till at a story over three mutat residence light case after a heal phones, and wire for letenna should not pro burden. Of course, for regular use

fome you naturally will prefer to use y are much more economical.

The circuit is, in many respects, similar o that used in the one-tube receiver described in the May number of Porular SCIENCE MONTHLY The main difference is that the tickler coll C in this month's

receiver is movable instead of fixed, and a fixed condenser is used instead of the variable one shown in the May set. This change does not affect the quality of reproduction, however

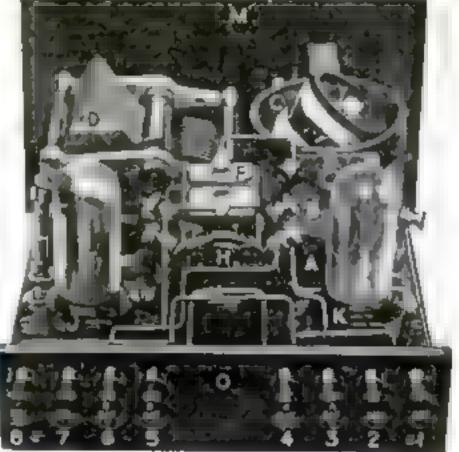
The receiver has been tested and approved by the Popular Science Institute of Standards. Tests in the Institute Radio Laboratory show that it gives exceptional selectivity, distance, and quality. In fact, the results show that, in spite of its small size, it gives an fine radio reception as can be expected from two tubes.

Connected with a 50- to 100-foot antenna hung from any convenient tree, and a ground wire thrown into a near-by brook or lake, thu portable outfit will bring in distant stations with excellent volume on the head phones.

The conventional shape of the receiver also makes it useful for regular use at home in cases where it is desired to keep the amount of space occupied by the radio equipment down to the minimum. There is no stan-

An Ideal Portable Unit for Summer Weighs But Three Pounds By Alfred P. Lane

August 1725



dard size of radio cabinet small enough to fit this receiver, however, so if you want to install the unit in a conventional type of eabinet, you will have to build the cabinet yourself. If you do not want to go to the trouble of building a complete cabinet, a simple dust cover out of cigarbox wood will be satisfactory.

THERE is just one point about the construction of this receiver unit that may cause the beginner some shight trouble, and that is the difficulty of making the connections between the various instruments because of the lack of space in which to work. If you have any doubt about your ability in this respect, the remedy is to spread out the instruments a bit by making the panel and hase board each an inch longer

The parts you will need to build the receiver are listed at the top of the opposite page

In selecting the parts for your receiver, the size of each part must be carefully considered.

The tuning unit A, B, C is a standard small-sized three-circuit tuner. For the benefit of those who prefer to build this part of the receiver, the primary coul A consists of 9 turns of wire, the secondary coll H is wound with 58 turns, and the tickler coil C has 16 turns on each side of the shaft, making a total of 32 turns. The form on which coils A and B are wound is 214 inches in dismeter, and the tickler coil form is 11/4 inches in diameter.

## Two-Tube Set

### The Parts You'll Need

HERE are the parts you will need for the two-tube portable unit: A, B, and C-tuning unit

D-variable condenser.

E-grid condenser, .00025 mfd., with grid-leak clips

F-fixed condenser, .0005 mfd.

G-rheostat

H-audio transformer, 5 to 1 ratio J and R -vacuum-tube sockets

L-grid leak. 5 to 7 megohms M-composition panel, 414 by 7

N-wooden baseboard, 6 by 6 1/2 nella

O - composition binding-post panel, 1% by 6% inches

Eight binding posts, three-inch dial, bus wire, tubes, batteries, etc.

Number 24 double silk-covered wire will do very nicely.

Any standard type of variable condenear can be used at D if it is small enough to fit into the space limitations

THE vacuum-tube sockets J and K in the model receiver are adapted to the S-volt dry-cell type tube, but there is sufficient room to permit the use of stan-dard storage-battery tu estif you desire, and this change would be a desirable one for the man who is going to use the cet on an adio camping trib, since the storage batters on the cas is handy for use as an a pattery. Some form of spring-base or cushion-type socket is worth while, of quarse.

The rheostat G of the model receiver has a resistance of 25 ohms. If you use 6-volt storage-type tubes or 1½ voit drycell tubes the rheestat should have a resistance of/10 or 6 ohms respectively

Because of the space limitations, the building and wiring of this receiver requires more care and time than a similar receiver of standard size. This means that you will have to study carefully the placing of each wire so that it will not interfere with other wires.

The laying out and drilling of the panel

is the first operation and in this you will be aided by the diagram in Fig. 8 on page 118. But before you start drilling any holes, make sure that the instruments you have purchased will fit. If, for instance, the variable condenser D or the rheostat G are larger or of a different shape than the ones used in the model receiver, you may find it necessary to use a slightly longer or higher panel to keep the instruments from touching each other.

After you have cut the panel to the proper size and drilled the holes for the chafts of the variable condenser D, the rhecatat G and the tuning unit A, B. C, together with the screw holes to hold the panel to the basebeard, you can proceed to mount these instruments and then attach the panel to the baset bard.

Next mount the au to transformer H and the sockers J and L on the baseboard The primary terminals of the audio transformer is should be toward the binding-

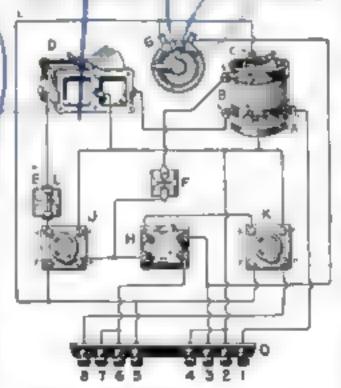
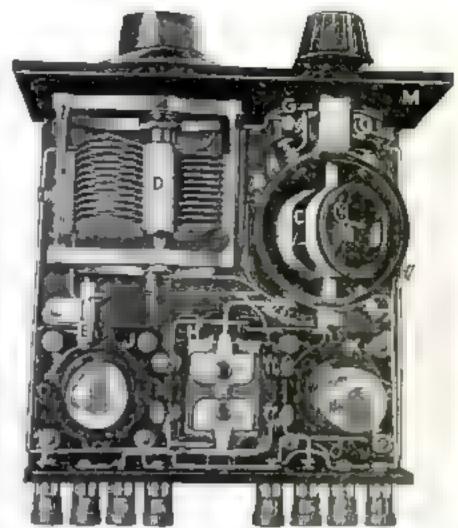


Fig. 5-Pictorial wiring diagram for begirmers who are unfamiliar with the symbols



4-View of the set from above. Notice how ingentously the instruments are arranged to conserve space

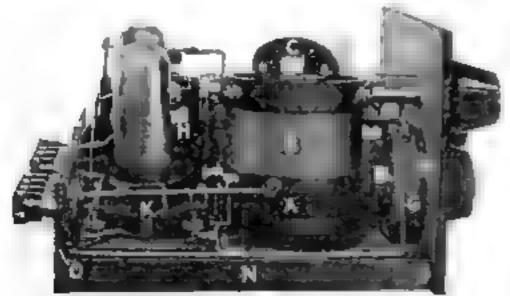
post panel and the grid terminals of the sockets should be near the front panel and at the left (as seen from the rear) if you use the 3-volt dry-cell tube sockets. Study Figs. 1, 2, 4, and 6 carefully before mounting the instruments.

It is a good idea to leave the bindingpost panel off until some of the wiring connections have been made. If you use the ordinary screw-type binding posts, it will be advisable to buid the panel in place while each wire is bent into shape. Then, when you have the wires ready, you can clamp down the binding posts on the binding-post panel and put in the screws that hold the binding-post panel.

WHEN you are satisfied that the instruments are mounted correctly, you can proceed with the wiring as (ollows

Connect the filament terminals of sockets J and K, which are nearest the front panel, and run a branch from this wire down between transformer H and nocket K and over to binding post No. 4 Continue this wire over to binding post No. 2. Next, run a wire from the F terminal of transformer H down to hind-

> ing post No. 3 and continue it around to one terminal



-Side riew showing the hook-up of the tuning coll

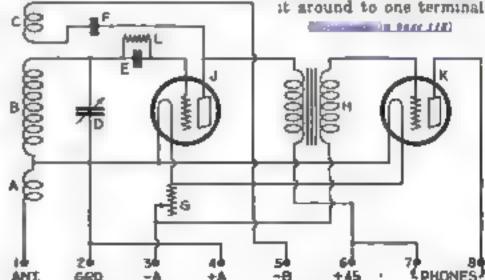


Fig. 7-Wirland diagrams with parts represented by radio symbols

### Summer's the Time to Overhaul Your Set

How to Prepare for Good Reception

By E. R. Haas

HE coming of summer affords us all a chance to take stock of our redio equipment and to do the necessary overhauling that will put our apparatus in extra good shape for another season's use. On nights when statle is exceptionally bad, the overhauling can be done without the feeling that some important broadcasting is being missed.

Haphasard digging around in the receiver with a screwdriver is not the right way to go about a systematic overhauling. To begin with, you should make a list of the things that ought to be looked oto, such as the list on this pagand then you can place a check mark against each liem as soon as you have attended to it

Since it is logical to start at the top, we can begin with the antenna

What is needed to put your antenna mystem in good condition will depend on how good a job you did in the first place and on how long it has been in place without attention. If you used a plain copper wire and the antenna has been up for more than six months, the chances are that the copper has corroded so that the surface is no longer smooth and shiny. The rough surface offers some resistance to the passage of high-frequency current. You can, of course, polish the surface of the wire with fine sandpaper, but you will find it much more satisfactory to benew the antenna completely with enameled copper wire. The enamed conting stays on the wire for years and protects the surface of the copper from correson.

THE insulators should be wiped care I fully to remove grime that edirects on them and acts as a high-resistance leakage path for the minute electrical dirrents in the untenna circuit.

You can't be too careful to support the antenna rigidly, for the weight of a long antenna covered with a thick layer of

sleet is considerable.

The connection between the lead-in and the antenna should receive careful attention. Corresion at this point will cause weak signals and may result in noisy reception. A carefully soldered joint where the solder actually has flowed on the surface of both the antenna and the lead-in wires, will not give much trouble, but if the wires merely are twisted together without soldering, it is a good plan to cut the lead-in, acrape another clean place on the antenna, and twist a new joint. If



### How to Locate Louse Connections

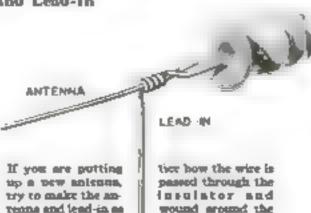
Disconnect enteres and groups than, with tubes in and B bettery and foul peaker con-nected, push such wireles turn with the cap and of a fountain peak. I cratching or choice moists indicates loose wire that more be found.

the make the antinna and leaders a confinence piece of wire. The identification at the notion of this page shows hower do it.

The next task is to test all the connections within the receiver itself. The ensure way to do this is to disconnect the antenna and ground then, while the tabes are littened the it between and loudeness are are lit and the B battery and loudspeaker connected, push against each wire in the receiver with the end of a wooden stick or the end of a hard rubber fountain pen. Also press against the tubes themselves.

Continuous Antenna and Lead-In

shown above. No-



entenna Wife

### Check These 10 Points

- 0.000 0.000 0.000 0.000 0.000 million and resident and

1. Clean insulators and renew autenna with enameled copper wire.

2, See that antenna supports are strong enough to withstand winter storms.

J. Inspect connection between antenna lead-in and antenna.

4. Tighten loose binding poets.

5. Test all connections,

 Make sure that contact prongs in tube sockets are making good contact with tube terminale,

7. Clean thoroughly the interant of your receiver.

Impact ground connection, Look over A and B batteries.

10. Inspect flexible cords of phones and loudspeaker.

----

If this procedure results in scratching or clicking noises in the loudspeaker, you may he sure that the wire being tested is loose at one end or the other.

In making this test, remember, however, that the contact between the prongs of the tube and the springs in the socket is rarely so perfect that no noise whatever will be heard when the tube is touched. To be sure that you are getting the best con-

> tact possible, it is a good idea to bend up the springs in the sockets a bit and clean the prongs of the tubes with a piece of sandpaper.

After you have made sure of good conpections, clean the inside of the receiver thoroughly. This means dusting off every part as carefully as possible, not forgetties to run a pipe-cleaner between the plates of the variable condensers.

The ground connection, because it is doors, is not subject to corresion as is that between the antenna and the lead-in. If you made a good ground connection when you first installed the receiver, you can be reasonably sure that it is still in perfect condition.

DRY-CELL A and B batteries require no special attention other than to see that all connections are tight. With storage batteries, however, it is a good idea to clean off the tops and terminula with a rag moistened with ammonia and then grease the terminals with vase-

Your storage A battery may have been on the job for several years and you now are beginning to wonder whether it still is good for another year's service. There are two almost infallible indications of deterioration. One is the fanure of the battery to hold its charge while standing idle. This usually means worn-out separators. The other is the failure of the hydrometer reading to go above 1260, regardless of how long the battery is left on charge. A low hydrometer reading when the battery is as completely charged

(Continued on page 119)

# Latest Novelties of Broadcasting

Radio in a Gave and on a Motor-Boat-New Inventions

### New Power Tube

Professor Holweek of Jans has just perfected a new demountable vacuum/rube below true fat 130 knowatts. Instead of droping at the nor frank the talk from there sealing it the nowat in smanns it on a remarkably of a entities on pump that a kept ranging while the table is in full operation.



### Radio in a Cave

Working 300 feet underground, Mr. F. et us, of the Midwaukee Public Museum found that re ho releved the testining following in model of a Virginia cover.

### Broadcasts Races

Station W.J.Z. New York, recently gave a vivia, account of a codege boat race by rebroad cost ag aignoss from a motor boat below equipped especially

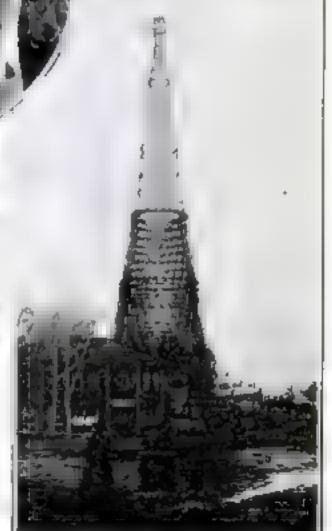


### New Loudspeaker

E W Kelling and Chester W Rice are shown above examining a hornion loudspeaker they have perfected. It operates on the electrodynamic principle and uses a paper cone about six inches in diameter.

#### Skeleton Mast

The most of a new radio station in Moseow Russia right, is built in an extended basket weave fashion. It is claimed that the structure is very rigid in the wind



### Tests by Popular Science Institute of Standards Reveal

### Surprising Facts about Tuning Coils

By Thomas Vanacore

N ADDITION to our regular test work in the Radio Laboratory of the Popular Science Institute of Standards, we are constantly carrying on research work along variaus lines and occasionally the results obtained play havor with some of the accepted ideas on good radia construction

Take the matter of radia tuning calls, for instance. Every radio fan who builds sets, and nearly every buyer of a factorybullt receiver, has ideas as to what constitutes a good tuning coil. Some prefer cotton-covered wire. Others inelat on silk Many persons also are prejudiced in favor of variour kinds of basket-weave totals

A series of tests covering every conceivable kind of radio tuning coil would, of course, be far too long to describe here, but the results of a careful series of tests on plain cylindrical coils just completed in the Institute's Rudio Laboratory, are so amazing that we feel sure every reader of Porulas Science MONTHLY who is interested in radio will want to know about them.

To begin with, we wanted to find our what advantage, if any, there was i sik-covered wire compared with cotton covered and enumel-insulated whe, since these three kinds of were are mostlyn use

Also, we wanted to settle the question as to what effect indistrict has on coils. This is highly supportant because a great deal of the poor reception in summer often blamed on mouture in the cotts.

TO MAKE the test a fair one, we used just one size of wire and one size of composition tubing. We first wound three coils, of 44 turns each, using the three kinds of wire. The lengths of the windings of the different coils were an follows:

1 9 16 aches No. 22 d a.c. 2 enamel

broadcasting To cover the wave-length range most effectively with a tuning condenser having a maximum capacity of 0006 mid we found that the num ber of turns required are

48 Lurus Catton Enamel 44 turos

These measurements are particplarly interesting to the home



Making the Moisture Test

Here is part of the apparatus used in the Radio Laboratory of the Popular Science Institute of Standards to test the effect measture on tuning code. Three cods we hung for three hours in a commet containing pot of boiling water on electric store

set-builder if he wants wind colls with insulation other the that spec-ified in the instructions to constructing the set he is working on enitie him to determine accurately the preser number of turns needed with any ope of the three kinds of wire when three inch tubing is used.

So much for the matter of wave length and actual constructional data. Now we come to the results of our tests We found that cotton-covered wire under these particular conditions is better for radio use than either silk covered wire or enameled wire.

The chart on this page, showing the comparative resistances for the various kinds of wire, talk the story in graphic form. Of course, the difference is not great and, in fact, it is doubtful if any appreciable difference could be noticed in signal strength under actual working conditions. Nevertheless, the fact remains that cotton le just a bit better then

WHAT effect has molature in the air on the efficiency of radio coils? We hung all three coils in

a metal box containing an electric stove under a pot of water as shown in the illustration. The current was turned in, the box closed and left for three ours. On opening it we found the later nearly all boiled away, water was naing down the metal sides of the box d the air in the box was as damp as the with the tropics after a savere rainstorm. We hastled the coils over to the test bench and repeated our resistance tests. There was no change—the meters read exactly the same!

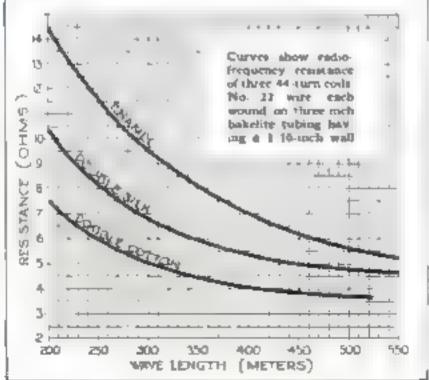
We could hardly believe the result ourse, ves it seemed so at variance with all of the theories on the subject. To leave no room for doubt, we took the coll wound with cotton-covered wire and deliber-

stely put it in a pail of water and left it there for neveral minutes. Then we took that coll, with the water actually dripping from it, and put it back in the test circuit.

HERE was no doubt about the resistance under these conditions. It was nearly seven times normal, but the startling fact that confronted us was that within a few minutes, even while the water was still dripping from the coll, the meter readings began to go up and before the con felt dry to the touch the resistance had returned to normal.

Think of it! Here was a coil so wet that you could feel the dampness in it, and still it was apparently perfectly good for radio These tests would seem to indicate that, short of deliberately allowing rain to fall in a radio set, or pouring a bucket of water over the apparatus, mosture can have little or no effect on reception.

500 550 250 450 WAVE LENGTH (METERS) Comparative Efficiency of Goll Wires This chart, showing the comparative resistances (in ohiss) of three types of insulated wire at varying weve lengths indicates that cotton-covered wire is the most efficient for radio coils



(Continued on page (17)

# Useful Ideas to Aid the Motorist

Dog's Coupé an Amusing Novelty



Wind hield

Engish idea for protecting the motorist's face. The curved screen is made of clear celluload and is pivoted on two press buttons fixed to the side of the cap so that it can be swing out of the way



Hydraulic Auto Lift

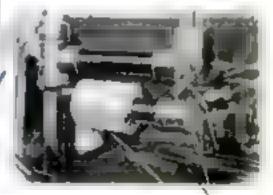
Not friested all under printing of used to primate the remarkable auto service platform. Compressed as the form the same exervoir, used for the impation, is used to obtain the necessary pressure.

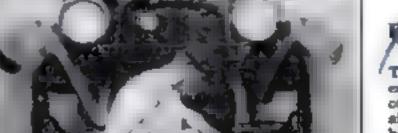


Baggage Trailer for Light Care

From France comes the solution of the excess baggage problem. The exercise is himself at the front and the wheel's act at a small to make it trail properly

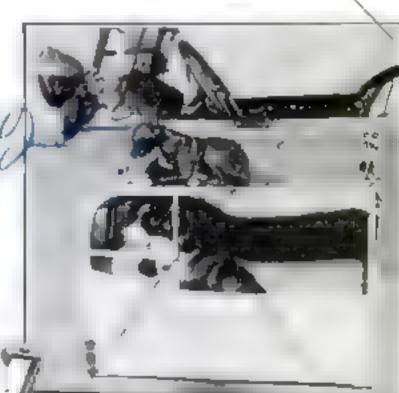
Centrifugal hir Cleaner for Augus Incoming us is plade to rotate repidly by directles were and the dust either into the detachable Container illustrated at the left





Ford Crankcase Brace

This brace is applied easily to the crank are of the Ford enguie. It side in prevention the busiding of the grand cale supportion with and brips to make the whole assembly more rigid. Vibration is cut down by this means



Checks Wheel .

This new what siner instantly shows dimensity by pointers outsials. It measures the patch and the toe-in. The reading on the dals is sheeked against a shirt, which gives correct pitch and toe-in foreach make of car

De Luxe Compartment for Dog

William Syker of Los Angeles has had this inique commissioners compe built for his dog. It has a sandahseld side contains, and an the summable comports cayoyed by his plaster

# Are Your Headlights Safe?



Wilson and Joe Clark, proprietors of the Model Garage, were still at work. Gus, the mechanic of the firm, was putting the finishing touches on a car he had promised to deliver in the morning to a man who was starting on a vacation tour, and Joe, who ordinarily held up his end of the partnership by taking care of the office work only, had been forced by the midsummer rush of repair jobs to rest up his electes and become for the time being a mechanic's helper.

A smart touring-car suddenly shot in from the street and came to a stop in the

center of the garage floor
"Hey, how about some gas?"
called out the young chap behind the driving wheel. "I've
been tooting my born out in
front for the last five minutes."

"Never heard you, son," responded Gus, while Jos hurnedly wheeled the portable gas tank around behind the car

Gus stood surveying the car reflectively while the filling process was going on. Then, as Joebegan to screwths cap on the gas tank, Gus wiped his bands in a bit of waste and strolled over to the front of the car

"Say, young fellow," he said,
"why don't you fix those headlights? You're due for a ticket
if you leave them like that."

"What do you mean, 'fix'?" demanded the owner indignantly, "Those are darn good lights. See how they light up your garage."

"Sure they're good lights," nodded Gus with a grin. "Good for you, that is. But how about the other fellow? He has some rights, too, you know Swing your car around so that the lights will be facing the back door, and I'll show you what I mean. There, that's far enough," caded out Gus, as the beams from the headlights lit up the white while while door "I'll ow step up close here. The taw in this state saws that no part of the theam should go higher than that I out lights, though, are adjusted so that at least half the beam is above the line."

"I know that," the car-owner broke in, "but if tip them down, I can't see the

"Quite true." amoutted Wilson "But you're violating the law just the same. Suppose everybody due thought as you do and used building lights and drove like or lightning? When the wouldn't be hospitals enough for the victims—or tow lars enough to drag away the wrecks?

Tile days of fast night driving with dazzing sights are gone forever. There are too many cars on the roads now. A driver has to think of the other fellow and adjust his headlights so that he'd get ad the light he needs without blinding every-

body he meets."

The car-owner smiled de-

risively.

"That sounds all right," he said, "but it just can't be done."

"It can't, ch?" snapped Gus.
"I wish you'd give me five minutes on those lights! If I can't make better lights of them and still have them comply with the law, I'll make you a present of my time—and throw in that gaseline you just bought!"

"Fair enough!" grinned the owner. "Go to it!"

Wilson got a tookit, stepped to the front of the car, and removed the front flange and lens from each headlight. Then he took out the bulbs and examined them carefully, holding them up to the big electric light in the center of the garage ceiling.

"There—see how much darker one of them is," he said, offering them so that the owner might observe also. "That's caused by little pieces, or mole-

#### Gus and Joe Save You Woe

THIS is the second of a series of stories by Mr Bunn, in which his two functionating characters—Gus Wilson and Joe Clark propostors of the "Model Garage," are giving you valuable tips from their issue experience on how to run your car efficiently, safely, and with the least possible expense.

If, by chance, you did not meet these two veteron automobile men in last month's mane, this will introduce them to you. Gus, the mechanic of the combination, tells you of the many little kinks that will save you trouble in the upkeep and operation of your car. Joe, his partner, the "figure man" of the firm, has a store of valuable suggestions on how to keep your motoring

The advice that Gus and Joe will offer each month is of practical use to every automobile owner. Each article in the series will be a complete story in itself. However, if you failed to read Mr. Bunn's first article in last month's issue, in which Gus told how to put your test in summer trim, it will pay you to go back and read.

And you won't want to mas next month's article, in which Gus will explain little known yet invaluable tricks of gear shifting that will help you get the most satisfaction in driving your car,—THE EDITOR,

cules, or whatever you call 'em, that fly off the hot filmment and stick to the glass. A few more days and this dark bulb will be ready to pass out for good."

"Phew, better et me have a new one!" exclaimed the owner. fact, you'd better make it two. They've been on

the job more than alx months now, and I do a lot of driving at night. Put in good hig ones so I'll have a lot of light."

"Nothing stirring," said Gus; "21candlepower is all the law allows you. and you have that give new. Of course, some of the 'gyp' dealers will sell you button marked with a higher rating than 21-candlepower, but the extra candlepower is mostly in the label on the box!"

"Twenty-one for me then—got two tickets for speeding this year and I certainly don't want another chance to say

"Good morning, judge!" "

"It wouldn't be healthy for your "Joe, get pocketbook," Gus chuckled. out two bulbs—make it three—you ought to have a spare,"

WHILE Joe went after the bulbe. Gus carefully dusted out the reflectors with a clean silk handkerchief that had appeared miraculously from a concealed pocket in his greasy overalls.

"Speaking of reflectors," said Gus, "one of those scientific sharps told me once that an automobile reflector that had lost enough of its abininess so that you could tell that it was not quite new would reflect only about 50 per cent as much light as when it was new."

"Well," the owner observed, "who'd expect a rusty old reflector to give much

hght?"

"Who mentioned rust lunk?" demanded Gun; "I meant a reflector that has lost its first bruttancy—test a bit forgy—not really-bad at all Fake your reflectors. They look like nw, but I'll bot they've lost at least 10 per cent of their light-reflecting power.

"Well, what can I do about that?"

anked the owner.

"Nothing," Gus answered. "Special buffing apparatus is needed to bring full

polish back to a reflector, and it takes an expert to run the apparatus. The best way for the rest of us to treat a headlight reflector is to leave it alone. Anyway, never do more to it than dust it off as gently as you can every now and then. Then when the shine goes, after a year or two, send it to some firm that makes a specialty of refinishing auto lamps."

"LEAVING them alone ought to be easy enough," laughed the owner: "but isn't there anything I can do to keep them from getting dim?"

"Yes. Have the front lenses fit as nearly surtight and watertight as possible."

When Dazzling Lights May Spell Disaster This picture Postrates the denser of un-tilted bradights in blinding the other fellow on the road. The dansing effect is increased when the car is going over the brow of a hill

"Why not use a rubber gasket in place

"Not on your life!" Gus said emphatically. "Don't use rubber on any account. It would make a water-tight fit all right, but after a while the aulphur in the rubber would discolor the silver plating on the reflector. The cord will do the work well enough, provided it is not squashed down so that it does not have any spring left

He fished a screwdriver out of the toolkit, and fitted it to the screwhead that

\$10,000

IF YOU have not yet en-L tered our great "What's Wrong" Contest, turn to page 29 of this issue and read how you can win one or more of the cash prizes.

projected from the center of the back of one of the headlights.

"See what happens to the beam of light when I turn this screw." by bade. Notice how it contracts and their inreads all over the door again. We will leave it where it makes a smooth, uniform band extra good bulk nice, even light. It's arriost impossible to focus the cheap buths some of the 'gyps' sell you.

Therel" Gus said as he tomed the screwdriver back in the toolkit after focusing both headlights properly. "Now we'll see about turning those beams down so that they don't hit the door

of that piece of cord, then?"

lamp bracket carefully. "This is going to be easy," he said; "the brackets are adjustable, so all we have to do is to

above the line."

He examined the

loosen up the bolts and set the headlights where we want them. Joe, just bold your hand on the door there so I can see

where the top of the beam ought to come

-there, that's right."

"But you have the lights pointed too low now," complained the owner as Wilson tightened the last nut.

No, THEY'RE just right. You have to make some allowance for the effect of loading down the back and of the car with three people. You want them right when you have a full load of passengers aboard."

"Gosh, I never thought of that," said the owner after studying the light on the door for a moment. "They seem to give a pretty good light at that. Maybe I won't have to dim them every time I pass another car now that they are on the right side of the law," he suggested.

"Not unless you are going over the top of a hill," said Gus. "That makes the beam shoot up in the air a bit. By the way, why don't you fit a spotlight?"

"What good would that do? The headlights ought to be enough to drive by."

"They are," said Gus, "except when you are going around a sharp curve. In the case a spotlight might help to keep you get of a detch—or keep you from righting comebody down traides, a spetlight is a big mip in reading road signs night and in turning the car rostre, it ought to be mounted so that you can throw the beam backward. Spotlights are all right—if you don't use them so that you are a nulsance to every one else on the road."

"COME people do," said the owner. "I Dessed a fellow like that last night. He nearly blinded me and then tried to push me off the road in the bargain. However, I think you're right about the good points of a spotlight. If I had one

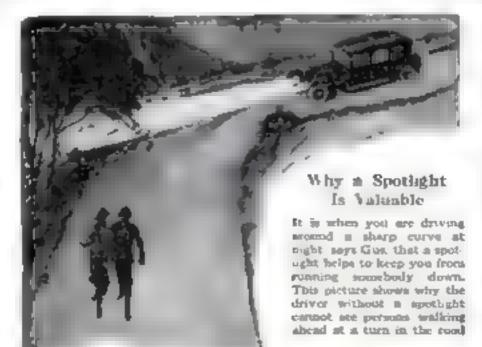
> it probably would help me in getting into my own garage. Got any good ones in stock!"

> "Sure, some dandies," Joe Clark broke in, instantly alert for anything that might help jangle the cash register.

The customer consulted his watch.

"I can't stop long enough to let you fit one now," he said; "but I'll be in temerrow-sure. Here, take out for everything," he instructed Gus, handing him a hill. "A fellow can learn something new about his car every day," he murmured thoughtfully.

"He can-and he ought to," responded Gus. "I've had 20 years of it, and I'm still icarning."



# Simple Jobs Any Motorist Can Tackle

Here Are Handy Kinks

ONSIDERABLE pressure often is required to get the last few inches of head over the edge of a clincher rim, especially if the tire is new and stiff, The simple arrangement of boards and a plece of rope shown in Fig. 1 will enable vou to apply pressure enough to mount the stiffest tire with ease.

If you want to make a permanent job, the shorter piece of board that resta against the tire can be attached to the upper board by means of an ordinary strap hinge,

IP AN electric drill is available, an easily made were scratch brush will make carbon-removal jobs exceedingly simple and speedy

Fine steel wire is rolled into a coil about 4 inches in diameter and one side of the coil is bound tightly with brass wire as shown in Fig. 2. Then the coil is cut at the side opposite the binding and the

bound portion is forced into the end of a piece of brass tubing attached to a shank that will fit into the drill chuck.

A little coldering flux is dropped. into the end, and when hot solder in poured in and allowed to cool, the wire is anchored firmly. If hard steel wire is used, the brush will last for a long time.

SMALL amount of the Initial valve-spring tension is lost through repeated facing of the valve and valve seat. There are two ways to remedy this trouble. One is to stretch the

springs, but this method does not always work, because springs that are stretched tend to get back to their original length after they have been in use for a short time. Another way to increase the tension of the valve springs is to place washers at the upper or lower ends of the springs as shown in Fig. 8. The upper position is preferable because it does not add to the moving weight.

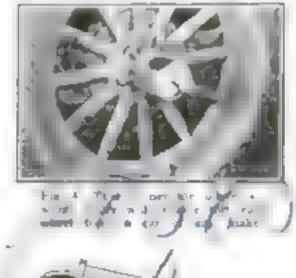
Be careful to see that the washers scat squarely, for if one side is cocked up. the resulting side pressure of the valve

spring will cause excessive wear on the valve guide.

Fig. 6. Fretien tage will belp to cut town for belt troubles if properly appled

IN FIG. 4 is - shown a good way to make a universal wheel puller that will work on any auto wheel regardless of the dimensious of the thresided porfion The shell of the wheel puller ande of 4-mch exten heavy from pape. A piece of If theh flat steel is fitted into one end and welded







the center of this plate and a M-inch. S. A. E. nut welded to the plate at the inside end of the hole.

At the other end of the pipe, six holes are drilled and threaded for ha-inch S. A. E. cap screws. The wheel puller is used by tightening the six screws against the wheel bub as shown in the illustration.

#### to Make Work Easier

When pressure is applied to the center of the axie by means of the long center screw, the threaded flange prevents the wheel pulier from aliding off, and the tightest wheel can be removed.

THE man who takes pride in his automobile makes a practice of draining the grankesse about every 500 miles. This is a measy job at best, but it will make the work easier and the draining more thorough if the front of the car is run up the incline to the garage as shown in Fig. 5.

If the incline to the garage is not great enough, then it will be worth while to jack up the front of the car as indicated. This will make it much easier to get at the drain plug with a wrench, and tipping

the motor will drain out the oil in the splash pockets under the connecting rods.

Another advantage is that the oil can be run directly into a regular bucket rather than into the shallow pan that often as necessary because of lack of clearance under the crank-

FLAT fan belts frequently give trouble through slipping or coming off the pulley. Both them troubles often can be eliminated by winding tape wound the center of the pulley so that the center is larger in Whitneter than it is nearer the edges. The belt then will have

a tendency to run on the center of the pulley and the tape will cut down the slipping. Another advantage is that if the belt runs squarely on the center of the pulley, it will not wear away the rim or the flange.

IT 18 easy to make a set of wooden jacks that will keep tires off the floor.

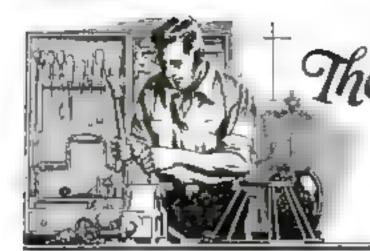
The jack illustrated in Fig. 7 is designed on the "knuckle joint" principle, using an ordinary strap hings as a knuckle. A 4-by-4-inch block serves as a base, held to the lower member by spikes. To prevent the length of 34-inch pipe, used as a detachable bandle, from hitting the bub

cap when the nack in raised, a apace block is attached to the front of the lower тетьет.

The jack is shoved under the wheel, back of the hub cap, as shown in the illustration. Then the pipe handle is inserted in the hose and the top end of it pushed toward the car, and the wheel us ramed to beight desired



Fig. 7 -60 mple just keep times off the after if the car is sty



# Home Workshop

Arthur Wakeling, Editor

# A Playhouse to Delight Small Girls and Boys

Built like a Real House with Ample Space for Toy Furniture

HILDREN never seem to become tired of playing house, even if they have nothing more than the back porch or a discarded table to represent the house. But their joy in this oldplay-time stand-by is fix greater if they can have a ministure house of their own large enough for them togeter, with wal doors and windows—a house that will hold their they furniture, their toy kitchen range and dahes, and all their big family of dolls

Such a bount, if carefully built, neatly bred with fiber wellboard, and well painted, helps to ablve the difficult troblem of keeping the chilizen from wantering away repathers own yard, perhaps to play in streets over becoming more hazardous with

the traffic of autos and heavy trucks.

Details for the construction of an especially realistic and substantial playhouse

are given in the drawings below. It was designed by George F. Kaurcher of Philadelphia, a recognised authority on

woodwork, who is known to renders of POPULAR SCIENCE MONTHLY through his contributions to the Home Workshop series of blueprints.

The house is 6 ft. 2 in, wide, 8 ft. 2 in, long, 8 ft. 4 is in, high to the top of the roof, and 5 ft. 6 in, high from floor to ceiling. It has a door and a double casement window in the front, another casement window in the back, and two fixed windows on each side. There are also two small arramental upper windows in front and back

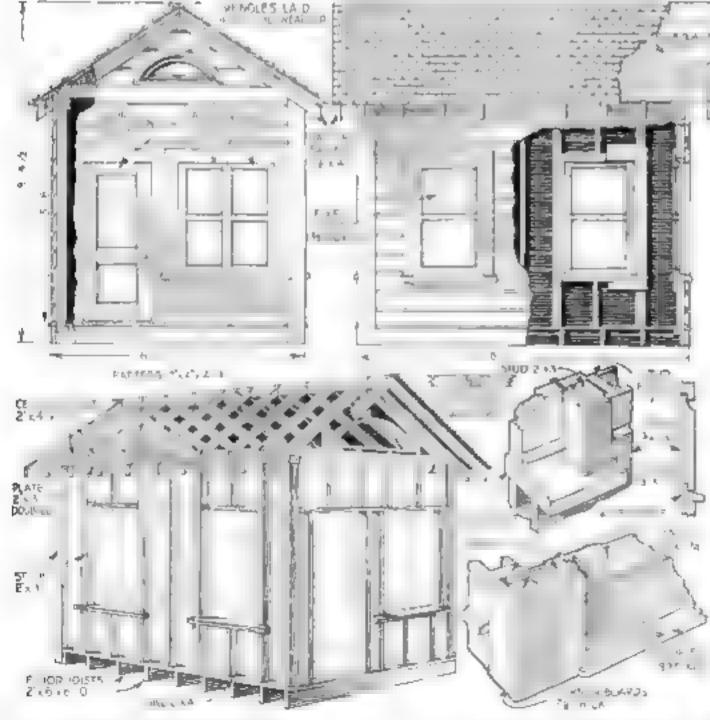
While the use of so many small windows makes the house seem more like a rual building, considerable work can be saved by reducing their number. A door and casement window in the front and one fixed sash in each side will serve.

The sash can be purchased readymade from your lumber dealer, and it is well to find out what stock sizes he has on hand so that you can make the framework to sult. The casement each, which are, of course, hinged, can open either in or out. The children prefer to have them open in, but it is easier to make them water-tight if they are hung so as to open out.

It is possible, too, that you can obtain a supboard door that will serve for the front door, if well painted. It is a simple matter,

(Continued on Jage 101)

THIS month's Home Workshop Department will be four d on pages 75 to 88 and 85 to 101, The Shipshape Home on page 84, and The Better Shop Methods Department on pages 82 and 102 to 108.



Front and side elevations of the playbones broken away to show the wall, floor, window and roof enastructions the method of framing and details of the massment windows at front and back, the door, and the water table

# Upholstering the "Hard Edge" Way

How This Simple Method Is Applied to a Stool or Seat

TRANCE as it may sound, the socalled "hard edge" type of upholstering gives a comfortable seat. example of this simple method of uphomitery is the footstool illustrated, which also might serve as a fireside sent

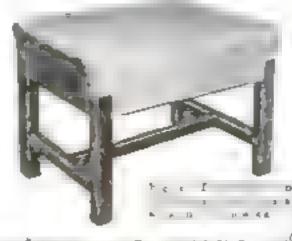
Many old-fashioned chairs, as well as some of the later styles, have seats with a hard edge. You are upt occasionally to have to repair a chair of this kind. That will prove a simple matter if you will construct the stool shown or even if you do nothing more than study the illustrations and the following suggestions carefully enough to learn the distinguishing points of this class of upholstery.

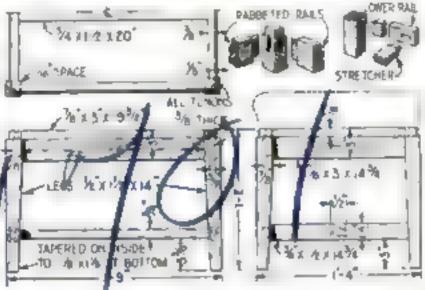
Any soft wood will serve for the rails of the stool (Fig. 1), as they are covered, but the four legs, the two lower end rails and the stretcher should be made of a hard wood such as oak or walnut Casters may be inserted in the legs, if desired, All the woodwork and the finishing should be done before commencing the upkolstering

As they appear in Fig. 2, from left to right, are the folighing necessary tools arriquipplies sheet wadding, box of gum tacks a zole of gimp, spalage, spring twine, webbing stretcher, curved needles double-pointed peoples, stuffing regulator, hammer shears; webling, and

kapok for staffing In an article of this series published last October in POPULAR SCIENCE MONTHLY (page 86) it was explained in detail how to attach the webbing and stretch it into

By William T. Weld Shopwork Instructor Central High School, Peoria, Ill.





place. Figures 8 and 4 show how the seat appears when the webbing is tacked in place and the springs sewed to it. The aprings used in this seat are gize No. 3, 534 in, across. The webbing is 3 1/4 in, wide,

How the springs are tied in place is

illustrated in Fig. 5. The knot (clove hitch) used for tying aprings was described in the May .seue of POPPLAR Sci-ENCE MONTHLY (page 104). The twine is fastened with 12-ox, tacks,

After the springs are tied, a piece of heavy burlap is placed over them and tacked along the edge of the rails where the wood has been rabbeted out as shown in the drawing (Fig. 1). Upon this burlap is placed the stuffing. Flax tow may be used and for a sent of this size about 4 or 5 lbs. will be needed. Pick out

any hard lumps and spread it evenly over the seat, allowing about 214 or 8 in. of it to protrude beyond the seat frame. Keep the surface of the stuffing reasonably level and the edgen well filled out.

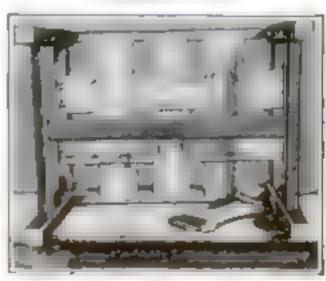
Over this is laid a piece of lighterweight burlap. The stuffing in pushed in along the edge and the burlap is slip-tucked to the frame, Hy alip-tacking is meant driving tacks only partway in so that they may be removed easily as the hughap in drawn down over the stuffing while it is being worked into posttion. Use a stuffing regulator to work the tow whenever the proper shape of the edge cannot be secured by working along the edges.

When the burlap has been allptacked along the edges, it is well to take several rows of statches with the double-pointed peedle through the two thicknesses of burlap and the tow. These

stitches should be 2 or 3 in, long and the outer row should come just outside the outer edge of the springs. Be careful in

Concerned on page 97)





webbing and the stitches that hold the springs

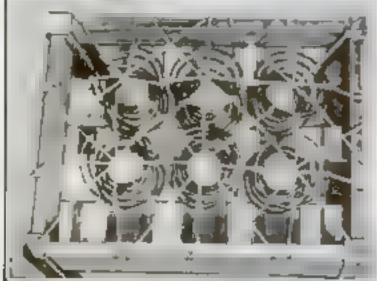


Fig. 5-The springs are tied down with lengths of twine. the ends of which are tacked very accurely to the frame



Fig 6-The stuffing, covered with burian, is arrived to form an erect edge

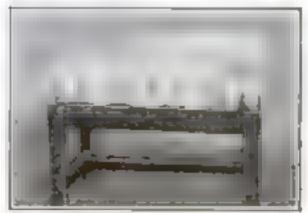
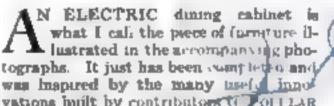


Fig. 7-The center is filled with stuffing and covered with wadding and madin

# An Electrified Dining Cabinet

Serves as kitchenette, table, and cupboard, yet looks like a fine cabinet when closed

By Martin H. Ellingson



er supported on a hingest tramework shown, to form a a rung shelf. The vone is waned a nais green and waxed by that it can be moved easily and a asperdly, it is mounted on heavy ball-bearing casters. blectrif aut.ets for attaching such cook-



SCIENCE MONTHLY and described in your past meure.

For any one with limited room in his home, a more useful article of furniture hardly could be constructed. It provides a complete electric kstchenette with dining shell attached, and has smple storeroom for food, utenalls, and duhes. When not in use for cooking or dining, it can be closed completely and

pushed against the wall, where it has every appearance of being a fine piece of livingroom furniture.

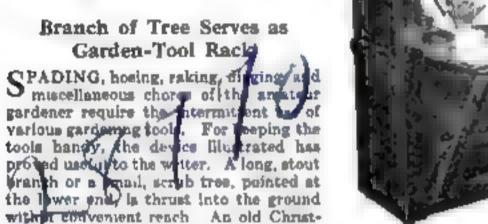
When closed the cabinet measures 4 ft long, 4 ft. high, and 17 in. deep. It is built from 8-ply veneer panels and odd lengths of old oak molding. The front panul is removed bodily to open the cabinet and half of the back drops down and

ing appliances as the coffee percolator, touster, chafing-dish, and stove are connected by concealed wiring with an outlet on the outside of the cabinet near the bottom, and this in turn is connected with an electric cord to a convenient base or floor outlet whenever a meal is to be prepared. An electric lamp auto is included in the permanent wiring of the cabinet.

This contribution Three views of the cabinet, showing disting was submitted in shelf, the electric equipment and storage POPULAR SCIENCE compartment, and as it appears when closed. MONTHLY'S recent

Photo Handieraft Contest and was given honorable mention by the judges.

lf you have followed with interest this and other Home Workshop contests, do not everlook the great \$10,000 contest announced on pages 29-31. who reads this department attentively should have no difficulty in telling what John is doing wrong in each of the puzzle pictures.



Trail Markers for Hikers

may tree serves well for this purpose --

A/E. ZIPPRICH, New York



ROCK markers consisting of two long stones laid close together with a list empoors and hikers. They are don't like e, or gyet the top of the flat stone, in ext signboard or marker at the point where the trail enters the woods ahead.

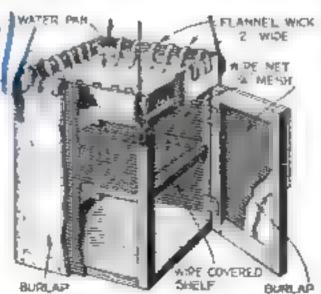
On wide open spaces, two or three of these nighting points may be placed in succession. - Armstrong Perry

# Simply Made Iceless Cooler Preserves Campers' Food

TDEAL for campers' food is what is warren of known as an "Arizona ice-box." A frame is constructed as shown and covered with gulvaniaed-fron hetting, which runs 4 or 5 in above the op The

outside netting is covered with two thicknesses of burney and a lin man is made to fit in the space on topol the box.

The box should be suspended to wires or ropes from a tree or scanolding. About two dozen strips of flames, 2 in wide and long enough to be to the battern of long enough to reach from the bottom of the water-pan in the inside to about 3 in down from the top on the cutside, are arranged in the pan as indicated. When saturated, the strips transmit the water to the burlap, where it spreads over the



surface of the entire box. The evaporation of this moustare absorbs the heat in the box and in dry, hot weather keeps milk or butter equally as well as ice does.

If the water seems to evaporate too rapidly and leaves the lower surface dry. put on another covering of burlap. A handy arrangement in to keep the box near a faucet and let the water continually drip into the pan.—E. G. G.

Finds Blueprints Helpful

I NOW am building a tea-wagen from one of your blueprints. They sure are a big help to any one who has a home workshop. As soon as I get this done I'm going to try another print .- F. E. F.

# Home Workers Show Their Skill Prize Contest Photos Offer Many Suggestions for Craftsmen

F YOU have been hesitating about making those new doors for the kitchen cupboard or building that long contemplated radio cabinet because the task seems a difficult one, take courage and inspiration from the photographs below. They show the best product of other home workers who, perhaps like yourself, began with only a small equipment of tools.

What can be accomplished in the way of making useful and beautiful objects

in the home never was illustrated better than in POPULAR SCIENCE MONTHLY'S recent Handictast Photo Contest. With the exception of the prize-winning contributions published last month, these photos were the best received and were awarded honorable mention

There seems to be an especial fearingtion in building inlaid tables. Many excellent examples were received, among the most elaborate of which are the four tables illustrated on this page

The phonograph is unusual because of the use of a violin as a sound chamber to improve the tone. The ship model has the distinction of being only 3 14 in. long. although complete to the last degree.

rectly and there is a man at the wifeel and a tookout on the forecastle.

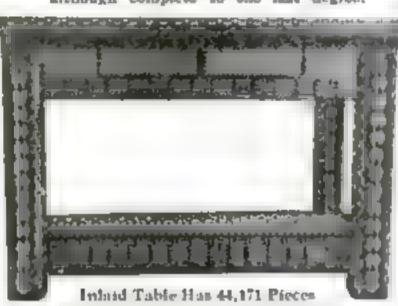
The candlestick holder and table lamps are curved from wood and beautifully finished. The candle is silver and blue with a base of old-gold color stippled in polychrome. The lamp stands also are in polychrome over gold.

Eight months' spare time was required in making the model of the moon, chart with key numbers is used to locate

the 700 principal features.



Built by William Bushler, 64 Louis, Mo-Contains 144 pieces of four woods. The top is 20 by 44 in. with three stars of making any and maple inlaid in walnut, and placed in a double border of mahogany and holly



Twenty varieties of wood were used by John Wharton. of Dayton, Ohio, in carrying out the color atheme of this table, which was built with ordinary hand tools. Pive years were required in its construction



This table, which contains 20 103 pieces, more has 15 000 of which are in the top surfact, was built by W. W. Flansgan, engineer at the Branch Agricultural College of Utah, Coder City, Utah. Minety-one varieties of wood were used and the work took six years in all



Miniature Ship Model A ministore ship built with probable and durning sendle by Douglas H. Burt of Lodianapolis, Ind.



#### Pedestal Table

A podestal table made entirely by hand by H. P Bust of Wichita, Kans. It has 8516 pieces of 18 different woods. The largest pieces are only is in, wide: the smallest, 1/32 in. wide. The top is 2014 in. square and the table stands 27 in high. Mr. Burt spent a few hours a week for six years in seembling and finishing it



#### Model of the Moon

Plaster-of-Puris model of the secon 12 in. in diameter. It was made by Herbert B. Collier of Viking, Alberta, Can.

#### A "Violagraph"

Built by Charles H. Fernald, of Maiden, Minns. When not in use, the violin potodine device is lowered by turning the crank and is completely umoraled by the quver

#### Lighting Fixtures

Hand carved woodes candlestick and two tuble amps made by William Buchler, who constructed the library table above

# How to Give Furniture a Beautiful Finish



The foliation Book gives complete instructions for finishing new and refinishing old trees soft or hard. This book is the teach of experts—beautifully dissirated in coins. Ask for a free copy at your best point or hardware store.



Stores displaying the above sign carry a full line of Johnson's Artistic Interior Finishes. They will give you a free copy of the Johnson 25c Book on Home Beautifying and ere competent to answer questions and gree advice on the proper finishing of wood. These stores will gloding show you paners of wood flushed to many bountful affects.

AFTER spending precious hours making furniture by hand you naturally want to give it a beautiful finish. And surely the finishing should receive its share of attention, for a beautiful piece of furniture may be ruined if improperly finished, whereas any small defects are minimized in a well-finished piece. So the finishing of your furniture becomes a matter of prime importance.

First apply a coat of Johnson's Wood Dye. With this you can color the wood any one of 17 beautiful shades. Johnson's Wood Dye is very easy to apply—it dries in four hours and will not rub off or smudge. Penetrates deeply, bringing out the beauty of the grain without raising it.

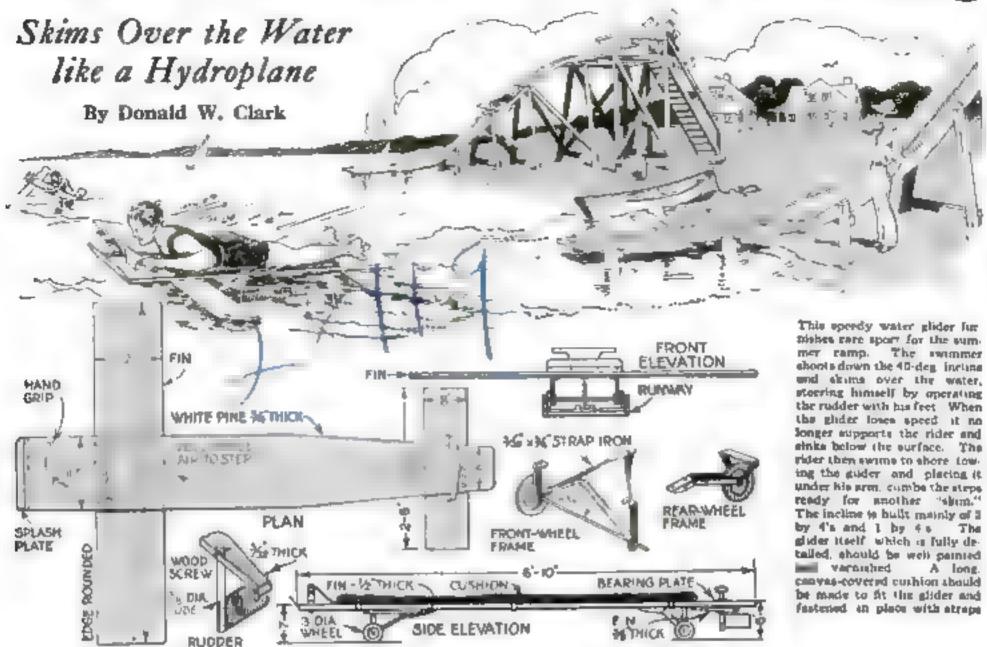
Open grained woods (oak, chestnut, ash, mahogany, walnut, etc.) should then be given a coat of Johnson's Paste Wood Filler followed by a light coat of Johnson's Under-Lac or pure white shellac. The furniture is then ready to be finished—either with two coats of Johnson's Prepared Wax or Johnson's Varnish. For close grained woods (pine, cypress, maple, birch, etc.), omit the Filler coat.

Follow these instructions for finishing furniture and you will be assured of perfect results—the thrill of pleasure when the work is new and yearly satisfaction at its wearing qualities.

S. C. JOHNSON & SON, "The Wood Finishing Authorities" RACINE, WIS.

# JOHNSON'S WOOD DYE

# Glider Adds Zest to Swimming



# Washstand, Oven, and Frying-Pan for Camp



Wash-besin supported

pecially appreciate a good stan ! for the wash-baain , By ift meg the materials of enture as spouts at the left, a washetand Ann be intade Aght on this spot

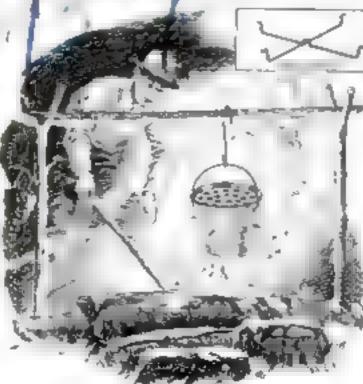
Unit down three large sapaings and trum them all to so the busk includes one brinch

that forks out by three beanchs Chout the

angle indicated Remove these offshoots about 6 in from the trunk and then turn the resulting sticks upside down so the butts and crotches are uppermost and the branches point in. Drive the stakes into the ground until the buttestand about 30 in. above it and equal distances apart.

HERE is never any necessity for unpalatable food in camp through lack of cooking utenails. Even baking can be done successfully with nothing more than an old water-pail

for an come Provided it has care and wire handle, a phil makes a good oven. best ha fwa, dews, punch four 32-in. Notes in it), bend two cross wires as shown, the spring therein place. These make a chelf for supporting a pan of biscuit or direct camp bed a winde baking. Make a the court to the the pail and punch a reformer 4 1, to holys in it. Hang the open by means of powers or small chain from the gross bar of the camp fire, or pace is directly over the coals.



An old water-pull with wire shelf and perforated his cover forms an excellent oven for enmy baking

A pair of square frying-pans may be made from two ten-cent sheetiron baking-tine about 2 by 8 by 10 in. In size. Punch two 14-in. holes in one of the longer sides of each tin as shown, shout \$ in. from the ends.

> Cut a slot 2 in. long in the same side directly beneath the edge wire. The slots allow the wire handle to be slipped through before the bent

FROM INNER TUBE

Frying-pans made

ends are inserted in the holes. One of the pans can be used for heating water if the two are not needed for frying. Baking can be done by placing one panon top of the other

Placed face to face, held together by rubber bands made from an old automobile inner tube, and slipped into a close-fitting canvas bag, these pans form a good size container for supplies. They will hold their own handles and some utensils, as well as the less bulky eating supplies.



You can still buy a hand saw that is the personal product of a crafteman's hands—and in which you can take a crafts man's pride.

Though the world's greatest saw works is alive with modern machines—many of them invented and built here in the Disson plant—

The fame of "The Saw Most Carpenters Use" rests square on the skill of the Disston workman.

The Disston Hand Saw seems abve as you use it. Perfect balance is the secret of its easy thrust and swing. Only Disston workmanship balances a saw that way.

The Disston Saw follows true on the line. The skill of a Disston saw-maker made it true.

It holds its cutting edge. Disston

workmen made the steel in that keen blade, hardened and tempered, set and sharpened it.

Henry Disston's first saws won their way on workmanship.

And so, when your Disston Saw makes hard work easy, you are getting a result that generations have worked to give

#### What to expect of your Disston

The springy, tempered Duston Steel binds that holds its keen edge so long—

The true, clean, easy cutting that is so quickly done -

The balance and swing that make it seem as a part of your arm-

These are the things that Dieston saw-makers, aided by improved

methods and modern machinery, work into the Distron Saw.

Go to the neatest hardware store. Take a Disition Saw in your hand. Read the promise etched on its shining blade.

Test that promise in use.

Try this saw on hard wood or soft, rough or fine work, for speed, east and clean cutting.

Then you will understand and whare the pride of the men who make the Disston Saw!

#### Ask Disston

Tell in what kind of work you are doing, in wood, metal, stone, twory, tubber, leather, cloth, fibre or other material, and we will tell you how to saw it better and enter. Distant fators many books to aid the user of saws and tools.

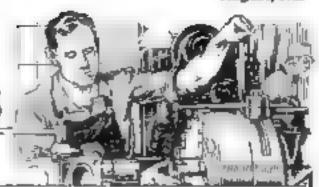
Henry Diseton & Sons, Inc. Philadelphia, U. S. A.

C Hardware dealers the world around sell Disston Saws, Tools, and Files



# Better Shop Methods

How Expert Mechanics Save Jime and Labor



# Old Bill Babbitts a Bearing

ERE is a tilce piece of work," Old Bill said to Bob Laten, pointing to a blusprint. "The casting came in from the foundry this morning."

"I wondered what it was," Laten responded.

"It is to be fastened to the old bracket

over by the door," Old Bill continued. "Let's go and look at

both pleces.

"Now, you see," Old Bill said, pointing to the details on the drawing, "this new casting is to he bolted to the old one so that they will make a frame for a pair of miter gears. The customer did not send the genre, so you will have to locate the center lines accurately."

Laten was looking at the new

"It will be hard to hold this in the shaper," he suggested. "It will be so far up from the vise that I will not be able to make much time on it "

Old Bill studied the casting

"I think it would be best to do the shaper work on a lathe," Old Bill said "You can chuck the casting by the round hub and equare up everything from the face of the chuck, then face off the ender Laten noduced managed

"I can tree of the corunt bearing for the gear at the same letting," he and It was some time after banch when Old

Bill next saw the jost

"I don't know what they are there for," Laten second red, pointing to the two setacrews in each side of the new casting. "but I she plitting them in."

"The designer had you in mind when

he drew them," Old Bill said.

"THE easiest way to get this drilling done is to drill and tap those setscrew holes first and put in the screws. Then you can put the new casting on the old one and hold it with the screws. Drill all the other holes. Use a 17/32-m. dril! for the stud holes, drilling them through both castings, and ream out the old casting to fit the stude. Then drill the bolt holes and the oil hole."

Old Bill looked at his watch. "Make the best time you can on this job, Bob," he added. "I got the job because I made the lowest price. I think I allowed four

hours for all the machine work."

The customer for whom Old Bill was doing this work came in to see how it was getting along. A young man, but Old Bill had found him to be full of mechanical sense, and liked to hear him talk about his problems.

"Looks as though you will have it done

By James Ellis Machine-Shop Superintendent\_



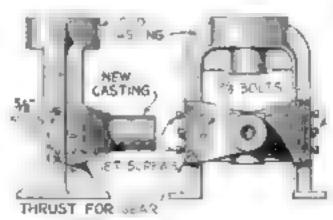
for me in the morning I be commented I shall have it to tree then if noth-ing happens," Out Presided "Very impaired many is to get the

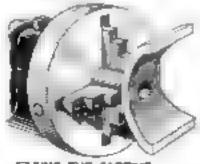
shalfwat right arging said the man, pld Bill amiled the realized why we being told sometaing he base. Old Bill bimself constantly told his mon things that they should know already

aware that men forget the little details just at the most important time.

"We will babbitt this in about half an hour," Old Bill said. "Stay around and see if we do it to your estisfaction."

The customer waited. In the back of





The new casting and old bracket as assessibled to form a frame for mitter gently, and method of bolding the new costing for machining

FACING THE CASTING

the shop was a forge that Old Bill used for melting babbitt. Near by was a planed surface plate. In a rack arranged

> according to sizes were a number of shafts used for babbitting mandrels.

> Laten brought the custings back and laid them on the plate. He selected two of the shafts, both I 15,18 in. The longer of the two he put through the bearings in the original bracket. The shorter one he put in the new cast ng. He blocked up the castings so that the bearing he was to pour was vertical. Then he started to melt some babbitt

> He found a set coller to put on the mandrel be was using. Then, with a small square he adjusted the shafts so that they were axactly square with each other. It was simple to get them in line, for they were both the same size.

The customer, looking on approvingly, said to Old B.Il, who had just approached.

"You seem to happen around whenever anything important is going on."

"Well, that is one of the things that I am supposed to do," Old Bill replied. "I get the blame if it is not right, so I

try not to be blamed." The act-up was finished. Laten used a putty made of asbestos and oil to prevent the molten metal from running out. Old Bill explained that it would not sputter and blow as plain mud would

ANOTHER little trick that may be useful to you some time le a method of pouring babbitt in wet places," be continued. "A few days ago we were making some repairs to a concrete nuxer that had burned out a bearing. It was out in the open and rain was falling. Of course there was water in the box, but we poured it without having the steam blow out all the habbitt "

"I suppose you put a shelter over the box and dried it out," the customer said.

"Nothing of the sort," Old Bill replied. "We filled the bux full of oil and then poured the babbitt in on top of the oil, The oil floated out, and there was no steam, even though rain was falling"

Laten, in pouring the bearing, ran in enough so that he could chip it off flush.

"Send it to me as soon as it is ready," said the customer Old Bill smiled. He knew the job would be satisfactory.

MANY time-saving shop ideas are contained in the continuation of the Better Shop Methods Department, which you will find on pages 102 to 108.



Why Does the Borrower Always Ask for Starrett



Combination Set No. 9

Layout - Checking-General Shop Work-actually, the uses of this splendid kit of tools are hmited only by the ingenuity of its owner. Taking up but little room on the bench or in the tool box, the Starrett Combination is a universal favorite with Machinists, Carpenters, Auto-Repairmen and Mechanics of all sorts.

Three attachments: Head, Protractor and Center Head slide freely on the Blade. They can be instantly clamped there in any 5 84

position or entirely removed. The Set gives you the use of a Rule, Try Square, Depth Gage, Height Gage, Level and Plumb, Marking Gage (note Scriber held frictionally in Head), Center Head and Protractor. Blade is herdened and graduated in either 64ths, 32nds, 16ths and 8ths or 64ths, 32nds, 16ths and 100ths, as desired. All parts well made and warranted accurate as you'd expect in any Starrett Tool. Sold by good hardware atores everywhere,

#### THE L. S. STARRETT CO.

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# The Shipshape Home



Adjusting cellar sash-Painting kinks-Chimney repairs - Trousers' rack-Brace and bits

Simple Win-

ADJUSTMENT for

Simple Window in the down Adjuster cellus arage, or motorboat, can be presented easily mid cheaptr as shown below. If the window is haged at the bottem a nail a driven into the edge of the sash, and a piece of safety of plumber's



chain is fastened to the frame with a screw. If the sash is hinged at the top, the chain is fastened to a floor beam or to the ceiling above the window. The desired opening is maintained merely by hooking a link of the chain over the nall. -J. F. HARDECKER, Brooklawn, N. J.

Cleaning Paint and Enamel

SHAVE 1 1b. of white somp and melt in 8 gts. of bot water. Add 1 os

powdered borax, and let the whole simmer, atirring now and then, until the scap and borax are quite descrived. Wash the painted surface with a fixanel cloth with this preparation, cleaning off with clear warm water

To clean enameled surfaces, first dust off and rub with a soft rag wrung out of not water and dipped in the finest whiting, or, better still, precipitated chalk, as the latter is less likely to cause scratches.

> Your Brace and Bits

KEEPING YOUR home shipshape you find frequent use for brace and

bits. If you do not own a praces or have only a cheap one it will par fourto get a good brace with a mitched attachment, A wide sweep is not necessary for ordinary work, but the tops should be of the best

Learn to use the ratchet freely; it is a great haver of strength. When well oiled, alight mot on of finger and thumb turns I on to left, right, or off. For corners and all awkward places it is invaluable. For giving the final turn to screws, and for drilling with large bits, it allows you to exert ample strength with the least effort, Indeed, it makes a small brace a very powerful toni. It is well worth practising to throw it on and off.

When much work is done, it is well to

have two brares. One need not be as expensive as the other. The countersink bit is kept in the cheaper one, or, if you are working on hard wood, where two bits are required for making screw holes (one the size of the shank of the perew being used and the other to suit the twist), you avoid constantly having to change buts or drills.—A. E. ELLING.

How to Clean Stained Brick

WHEN a brick mantel or chimney place becomes stained with soot

or smoke, the discoloration usually can be removed. Take I gal of sort soap, I ih liquid ammonia, and 2 or 3 to finely pulversed pumice store. Mix to the consistency of ordinary dipaint and apply to the stars with a tiber brush. In half an hour rab Ahe place well with a fiber scrup brush. The lather made by the process may be removed with water and aponged it may be necessary to repeat this operation

Should the trouble persist, it will be necessary to give the brickwork a very thin coat of paint made from Venetianred ground in oil, thinned with turpentine. If a lighter color is required, add some yellow other; if a darker color, add a little

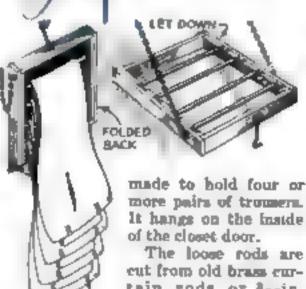
brue - A ASHMUN KELLY

Hanger for Trousers

SO SMALL IS THE usual clothescloset thete is well | named a

clother-press. Any closely pace-saving devices, therefore can and a keeping a house supplies.

The trousers hanger illustrated can be



tain rods or 3,-in. wooden dowels. When the hanger frame is "let

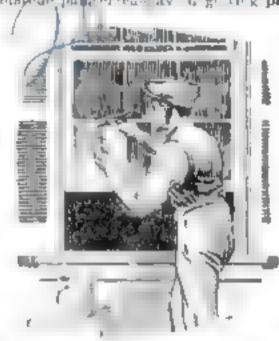
down," it takes but a moment to alip a rod through the doubled-over legs of a pair of trousers and replace it.-F. S. ROOT, Fall River, Mass.

SLIGHT scratches on window glass, whether common or plate glass, sometimes may be removed with raw cotton charged with jeweler's rouge.

"Helper" for Painting Sash

AFTER her house had we to painted bor man spent

her spare time for a la hour of gapaint from the mark w for wind whates Such with you define stary Free an amajour publications av a getting punt



on the window-glass if he uses a painter's tin, or "helper," as it is sometimes called

The one illustrated is an improvement over the usual tin or cardboard helper, because it is made exactly the size to fit the smallest panes, in this case about 8 by 10 in., and has a bandle. The handle is from a discarded coffee-pot.

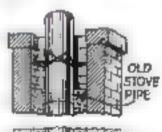
When painting around panes larger than the helper, it is necessary to shift the tin along, but the handle makes that easy to do and allows the protector to be held so firmly that there is little danger of paint getting underscath the edges and on the glass .- George T. BROSEC, Northfork, W. Va.

Relining a Chimney

A CRACKED chimney is dangerous and a serious fire hazard. In some

cases a repair can be made cheaper and without any skill in masoury work by the method iffistrated. Put some old rags or paper to the bottom of the chunney, where the stove-pips enters,

and they connect -some old stave-piped and lower they inside the changey Fill in all agound with concrete, tusing a mixture rich in cement. The concrete should pour readily and flow around the pipe without leaving any voids. - OSCAR. M. ANDERSON.





BASE OF CHIMNEY PLUGGEO TEMPORAR LY

#### The Home Workshop

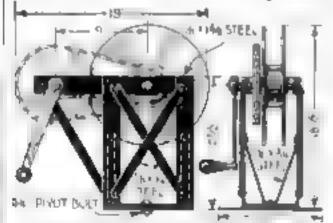
Large Kite-Flying Reel Built from Old Bicycle Parts

By Hugo Ljungquist



UT of some material from a discarded bicycle, I assign a relief o Kite and game asked for the acuse on which that extents up. The specket where any chain ase were used. The in all is from its old meat grafter,

The sail bearings are of an ineffensive grade. The base, which is collapsible, is 18 by 18 in, and is made of six pieces of



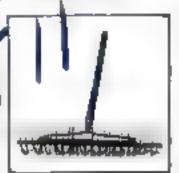
Construction of the seel which to goodneed upon a been seabown in the photograph above

I by I by 54 in. angle iron loosely joined with 5/18-in. rivets.

Using this reel, I have flown kites 11/4 mlies high with perfect control and ease; and when the lure of the sea called, I have gone down to the fishing place and with the same reel landed quite a few big drumfish and other game fish

#### Salvaging a Wire Rake

AWN rakes with wire, teeth are some times of such weak to strice tion that the bar holding the teeth brenks from the handle portion. The accompany-



ing Mustration shows a novel and simple way of protonging the medulness of such cripples by wiring the bar to a heavy garden rake, thereby making a very satisfactory combined lawn and garden rake -E. W. CORNELL, Adrian, Mich.



# We tried 130 times

Before we perjected this unique Shaving Cream

Now let us send you a 10-day tube to try

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It is different-radically, and immeasurably different-from any shaving cream you have ever tried.

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These you'll find-these new shaving joys, these comforts unknown before.

1 Multiplies itself in lather 250 times.

2 Softens the beard in one minute.

3 Maintains its creamy fullness for 10 minutes on the face.

4 Strong bubbles hold the hairs erect for cutting.

5 The palm and give oil content leaves the face in fine condition.

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Now in justice to yourself, and in courtery to us, please accept a ro-day. tube free. Give us a chance to prove our claims. Find out for yourself whether your present method is not failing in some important ways,

To add the final truch to shaving luxury, we have created Palmolive After Shaving Taleespeciall, for men. Doesn't show. Leaves the skin smooth and fresh and given that well-ground look. Try the sample we are sending free with tube of Shaving Cream.

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Many readers of POPULAR SCIENCE MONTHLY now never undertake an elaborate project without a blueprint to guide them. Letters of appreciation come to the Edstor from all parts of the world. Here is one from Mr C Stentiford of Dunedin, New Zealand:

Once again I have the pleasure of addressing three again t have the pressure of aggressing mark to you a should reterin it a favor if you would forward to me the bluepe stoll have marker on the inchesed coupon. Non, 17, 24, 76, and 30.

I have had no deficulty in following the methods and detains in the blueprints that were near to me and I think heattern to re-

gratuate he are due to you as we'd as somete thanks it mail home waters who use the opportunities that you offer them by featuring to the themetic he Home Workshop and Blueprint Departments.

The Editor asks why we read POPULAR SCIENCE MONTHLY Well, he of to the man-Service Moximus. Well, he of a the man-azine and should know the case of material he puts at: it it is full of all soits of kinks helpful methods of with any interesting articles in all manner of ashiects, and any man who cannot find someting to interest him in P.S. Mought to be with his processor, In the February must the larger to hand here, you have the definite of a bulletic chest

Continued on page 4

#### Complete List of Blueprints

ANY one of the blueprints listed below can be obtained from POPULAR SCIENCE MONTHLY for 25 eenta. The Editor will be glad to answer any specific questions rela-tive to tools, material, or equipment. Blueprint Service Dept.

Popular Science Monthly 250 Fourth Avenue, New York

Send me the blueprint, or blueprints, I have underlined below, for

white	St T 1D c1 000		Ct	enta:
No.	T (tie		Published.	Penn
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42 0	me Tube Radio	Set	May 25	33c
47 7	hree-Blage Amp	ALLIEL.	July, 25	25g 25g



Name

#### Smoking Cabinet and Workbeach

A smoking cablagt (Bitterwint No. 2) and a home weekshop beach (Blueprint No. 15, one illustrated at the left. Hinged ashtrays are concealed in each end of the smoking cabinet. Four attractive methods of ocustoesting and finishing are possible fully in the blueprints

vacaished painted with a Soral design, carved. and taled. Both the amphing stand and the bench are detailed.

#### The Home Workshop

#### Are You Using Our Blueprints?

Continued from som \$6

of drawers. I have studied the method of construction as portrayed by the drawings and think that that a the simplest way that I have seen in anything of that line hold formiture, even the plant mode's is pretty expensive in this part of the world and is occurred to me, could other articles of furni-ture of the box or cabinet style, he built on the Salem plan—a wardrobe, for instance, with

In conclusion permit me to extend to you my best wither for the success of your maga-

It is a constitu

Beinre you start another elaborate project in your home workshop, why not see just what the Blueprint Department has to offer you? Especially to be recommended are the following blueprinta.

No. 2-Smoking Cabinet, So popular had this been that the tracing was worn to a rag and the blueprint was withdrawn, but the orders continued to come in and the blueprint had to be re-issued. This is an extraordinarily good woodworking problem for the beginner, because several different ways of making the cabinet are suggested and, while the workmanship is not difficult, the finished piece is equal to some of the most expensive commercial cabinets featured by exclualve Fifth Avenue, New York, tobac-

No. 5-Kitchen Cabinet, Contains the details and complete bill of materials for a white enameled or varnished kitchen cabinet of especially attractive appearance. The design includes a self-contained sent, which is rarely found on even en-

pensive commercial cabinets.

No. 15 -- Home Workshop Beach, Shows how to construct a cabinet type beach of the most substantial kind, with every convenience in the way of exhincts and drawers-a bench that it is a delight to work at, one that any mechanic would be proud to own, and one that will last a

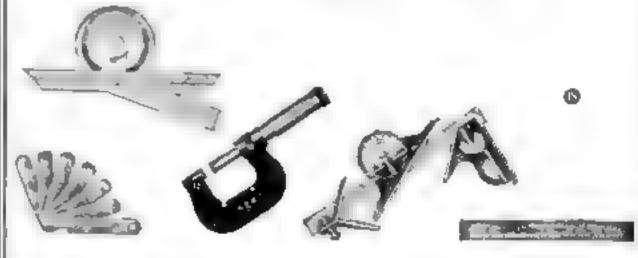
No. 41-One-Tube Radio Set. Everyman's radio set. It is exceptionally simple in construction, easy to tune, brings in distant stations with clarity and near-by stations with volume not exceeded by any other type of regenerative receiver. For the man who does not own a radio set, this is an excellent one to start with; for those who already have sets, even multi-tube receivers, this is very apt to be a revelation in efficiency

No. 42-Three-Stage Amplifier. An audio amplifier designed to give remarkably perfect reproduction of music and voices. It can be added to the one-tube receiver (No. 41) or to any other good detector circuit. Radio fans who are accustomed to the average two-stage amplifiar will be amazed at the quality of this resistance-coupled amplifier.

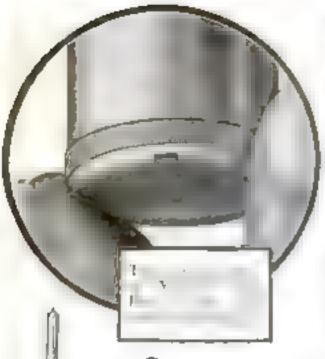
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If you wish one or more of these blueprints, fill out the coupon on page 86 and mail it at once to the Bineprint Service Department.





"Standard of the Mechanical World"



#### Seven Adjustable Tensions

at the turn of the cap

Want to bore a 1/16 hole in brittle wood? Turn cap on handle to left and get an casy, light tension.

Next you may need to drive a 5/32 dril, into rough 1 mber That needs a powerful tention You can get it by turning cup to the right

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# Make Better Mechanica

### Ten-Cent Measuring Tape Used in Making a Magic Card "Pull"

By Kenneth B. Murray

NE of the professional stants axhibited by the amateur of professional marician is the of causing an unprepared playing said to rise from one

hand to another 12 men more above. The trick on the call a "pull," as shown below



Purchase a small spring measuring tape for 10 cents and after unwinding it out off all but un inch or two-The a fine black salk thread to the stub of the tarm



When on much thread as possible is wound up, cut it off near the case and He & small button firmly on the end



The botton must be treated so that it will stick to a playing card. This is accomplished by ameurand one aste with common beginning



A strip of surgical adhesive tape is tered to fasters the measuring tape but on the buck of the wrist. Care must be taken to place it sufficiently for buck on that the cost sleeve will concest it completely



In presenting the effect. hold the prepared button between the first and second fragers and take cure to stand against a black background Allow the cards to be exammed if you wish. The button then to premed against the top card of the pack which is held in the left hand. When the card is released, it Boots gracefully to the right. hand because of the pull exerted on the black thread by the spring in the tape-measure page



SCHEDULED for early publication are the following articles: How to Fit Up an Attic Room, Repairing an Electric Iron, Simple Pocket-Knife Carving, A Unique Doll Boxing Game, How to Apply Polychrome Finishes, A Spiral-Log Davenport End Table, Relining

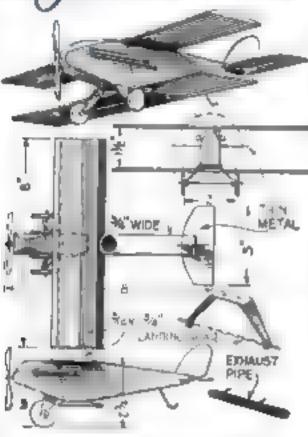
Automobile Clutches, How to Make an End Lap Joint, A Workshop Natl Cabinet, Homemade Jigsaw, Constructing and Finishing a Two-Tone Radio Cabinet, Novel Mats and Baskets Made from Corn Huske, A Ball-Bearing Drill, and a Photograph-Print Washer.

#### The Home Workshop

#### Toy Model of Racing Airplane Whittled from Soft Wood

WHETHER or not you have whittled the toy airplanes described in the June and July issues of POPULAR SCIENCE MONTSLY, you will find the racer model illustrated below easy to make and at the same time a realistic and fascinating to This model, when neatly painted, profits the children better than the firmsy in airplane toys that are you to common,

The body is weittles from a piece of soft pine for other woods a by La by I in. The wines, which are 3/16 by B in , are fastened to the body with brads and glue. The might gear consists of two wooden



Whatever dimensions are not given in these drawings can be estimated closely enough by eye

wheels 3/16 in thick and 1 in in diameter, mounted on a wire axle, as illustrated

The tall members are cut from thin sheet metal and inserted in slote in the body. Brads are used to make the fastenings secure. The propeller also is thin metal mounted on a brad or escutcheon pin driven into the nose of the body A glass bead serves as a spacer between the wood and the propeller. The exhaust pipes are cut from a 8, 15-in wooden dowel.

The body should be painted dark blue and the wings gray. The cockpit may be merely a circle painted black or a shallow hole bared luto the top of the body, just behind the trailing edge of the upper wing.

The fourth toy in this series will be an exprese cruiser.— D. W. C.

Sliding Clothespin/Bac

the inmuly wash on u . I hea line of the 3 ard 13 p offe that has t pulley 13 page easier by the are of aliding and helipin bag like that Illustrated. The bag is fastened to a wire frame.-I. E. Houk.





# Saws are blind as bats!

OCCASIONALLY they will strike a snag that even you cannot see, working havoc with their finely tempered teeth.

But a good saw has amazing recuperative powers---especially when "treated" promptly with the right NICHOLSON File.

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VAUGHAN & BUSHNELL MANUFACTURING COMPANY

0

# The Home Workshop

## How to Build a Ventilator

Louver Type of Opening Simple to Install in a Frame House or Garage

Reither through

damage or deare for a change of mail in placement.

For the transc house there is probably no better type than the lower wait, which consists of a number of horizontal lanes inclined so as to shedwain and snow, and cased up to the majorer of a window-frame. Such yents are adaptable to and lay the

almost any size of shape of opening, a n d if carefully made are not only well suited to their purpose, but are artistic.

Whether the house is sided-over sheatbing, or the weatherboarding is nailed direct to the studding, matters little in the building of the ventilator. The outside width of the frame should be at least 1 in, narrower than the distance between the side trammers of the opening, to

allow for wedging and plumbing, while the height must be such that it easily will clear the trimming headers.

Use 1 by 5 in, stock for the jambs, Joint and surface the two at one time, as a pair, and lay out both for dades to receive the ends of the vance as follows: At the bottom, a groove 1 in, wide, and at 5 in, intervals, measuring top to top, grooves 14 in, wide, all inclined at an angle of 60 deg, with the edges. Gage these for a depth of 14 in., saw the sides by cutting in the waste wood, and remove the chips with a chief. Some workmen merely butt the ends of the vance to the jambs, but the vent is much more difficult to assemble and the construction is decidedly poor.

Cut all the vanes of 1 by 6 in, pine 1/2 in, longer than the inside width of the ventilator. The 2 by 8 in. sill is beveled on the edges to correspond with the slope and is notched from the back at both ends to the width of the jambs as measured along the dado. The main length of the sill therefore in equal to that of the vanes. Leave the projections or "horns" 5 in long. Assemble all the vanes and one end of the all with one jamb and then sail on the other jamb. If the parts are oiled or primed before assembly, the job will be so much the better. Plane the projecting edges of the vanes to alme with the jamb edges.

Use 1 by 4 in. clear stock for the casings. Cut the head casing 10 in.

M. Love longer than the inside width of the vent, and nail in place with the lower edge 3 in above the lower edge of the top vane. Suggest the assembly, and cut in the

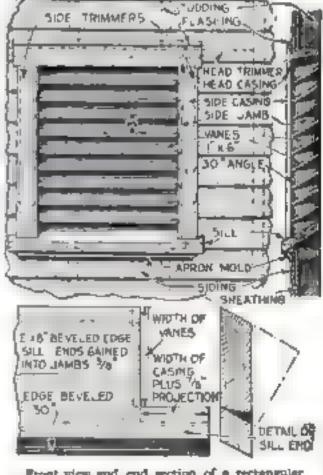
An easy way to get the

An easy way to get the length of a side cating in to cut the bevel on the lower end, lay the vent on its back, and lay the casing upside down in place

with the point against the sill and blocked up from the jamb 1/4 in., and mark the upper and by the head casing. Cut a trifle long so that the joints will be forced tightly together when the essing is nailed on. Put the inside edge flush with the face of the jamb. Cover the back with screen wire to keep out birds and files.

Cut off the sill horns so that they project beyond the edge of each casing, a distance equal to the





Front view and end section of a rectangular hower vent and details showing and of nil

projection in front, or about 1 in. Give the same amount of projection on the head casings of the house windows.

In setting, slip the ventilator into (Continued on page 91)

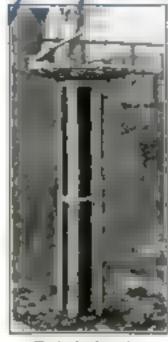
This seal on a radio or tool advirthement signifies the approval of the INSTITUTE OF STANDARDS. See page 17.

#### The Home Werkshep

#### Birds' Bath and Sun-Dial Made Entirely of Wood

NO GARDEN is complete without some provision for the birds, lieu lovers may combine a \$ read both and a sun-dial with pleasing effect of a tons earn the lasting grat slide of pour filing fenthered fragels

The center column histrated (2 %) 3 ing and the four rough state surrounding it (16 by 1 in.) extend 4 it. above ground. The bann nailed at the top is made from two circular pieces, each 2 ft. in diameter and 1 h. thick, one glued on top of the other. The top plece is like a doughnut with the large center removed, leaving only a 3-in, rim or edge on which the figures for



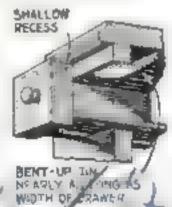
Both bird and both are curved.

the sun-dial of the twelve hours are carved or even painted, as your taste dictates.

The shadow is cast by the extended bill of a carved wooden bird perched on the rim. The under side of the plate or bowl may be carved to represent a large seashell .- A. MAY HOLADAY.

#### Tin Strip Safeguards Contents of Tightly Packed Drawer

TO PREVENT objects in a drawer from catching when the drawer in pulled out, I faaten e plece of tin to the upper drawer rad as shown. The tin in about 6 in. water and not quite ase long us the drawer.



The maide Fage of the distant is piller t down so I to the trub hearnst the tin. which in wall lowle a the drawer is abut ATHUR FLIMNER, Wichita, Kans.

#### Building a Ventilator

(Continued from page 90)

place from the outside, plumb the jambs, and nail through the casings and head into the side trimmers, literward wedging the sides and sill tightly. Lastly, put underneath the sail, an aprox made of 3-in, bed molding with a return nutered

on each end.

If it is descret to have the siding boards built against the manner, set the verit without casing and fit the casings one work the ends of the boards. Or, if it is now work and the ading is not yet on, first build the ventilator complete and fit the hoards to the casings after it is finished.



# Lightest—Most Compact— Most Complete Portable With 4-row Standard Keyboard

FOUR years ago Remington announced the portable typewriter with a 4-row standard keyboard—the keyboard universally adopted by business as the best. In this comparatively short time the Remington Portable has become the leading personal writing machine throughout the civilized world.

The New Remington Portable is fundamentally the same tried and true typewriter, with several improvements that make it unequaled in general efficiency.

It is the lightest and most portable Portable with 4-row standard keyboard, it is the most compact Portable; it has the longest writing line of any Portable; it accommodates full width paper and long envelopes; it has the finest touch and action; it does beautiful work; its durability has been proved; and all the writing is always visible.

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#### REMINGTON TYPEWRITER COMPANY

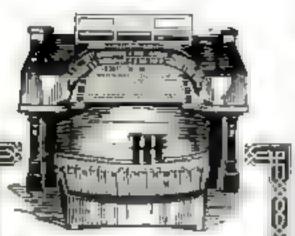
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# emington Portable

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<u>ೆ ಇಟ್ಟಿಂಂಗಿಂಂಗಿಂಂಟಿಂಂ</u>

## Sturdy Swinging Cut-Off Saw Frame Made of Pipe and Fittings

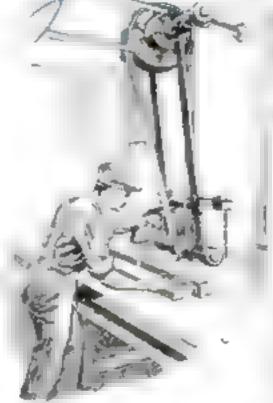
By Frank N. Coakley

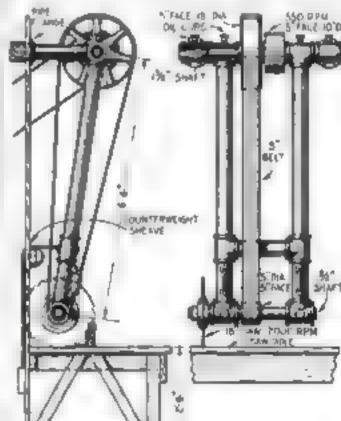
NEVER long boards or timbers have to be cut to length in any quantity, a swing-saw is almost indispensable. The owner of a small wood-working shop, the farmer who does much construction work, the small building contractor, and the pattern-maker can, build the frame for such a saw at relatively small cost for material by following the design illustrated

This is not only a cheap say to make. but a see a sturdy machine and one that what proper handling abould had The material from which if is conditioned by standard and there bearings. This is especially necessary for the saw mandrel.

For the naw mandrel another piece of 1 4-in. cold-ratied atecl is used. The saw end is turned down to 11/2 in. n Att. This shoulder acts to back May Washers, which should be about **I**m. in diameter, 34 or 34 in. thick, bevel to as shown. The pulley on the mand clus 5 in, in diameter with a 5-in face, reducely keyed to shaft, which runs about 2000 r p.m.

The frame itself is made of lengths of pipe. While 6 ft. 6 in. is called for, 6 ft. would work out autisfactorily, but anything shorter would give too short a belt for driving at the speed mentioned. A cross brace is provided to prevent any weaving action in the frame. All the





This swing saw which is designed for the small shop, can be built without expensive machine work

should be no trouble in purchasing it, even in small towns.

While no eases are given for the various fittings, I do not advise the use of anything smaller than 216-in, pape for this size new However, if one were to build a frame for a 12-in, saw, 2-in, pape would be heavy enough.

The frame is bung from two brackets of pipe that are fastened to the side wall with two standard flanges. The tees on the brackets are machined to allow the end pieces of the swinging frame to pass through. The top and bottom tees of the frame are babbitted to form the bearings for the countershaft and the maw mandrel.

The countershaft is a piece of I 1/4-in. cold-rolled steel, having a keyway for a 3;-in. square key. The small or driven pulley is 10 in, in diameter with a 5-in. face; the driving pulley is 18 m. in diame ter and 5-in, face

The countershaft is to be run at 550 r.p.m. At this juncture, care must be taken to provide oil or gream cups and to be sure that the lubricant gets into the

joints must be perfectly tight, as the machine may receive more or less abuse.

Two handles are fastened, one to each frame, for pulling the saw through the wood. This operation can be done just as well with a foot lever carried up in back of frame and fastened to the bottom tee with a link. To pull the saw away from the wood, a counterweight is used. While some prefer springs, the counterweight la always dependable.

The table may be made from any lumber that bappens to be handy. The back board can be made a sliding affair, if desired, steel angles supporting and holding it to the table.

It is essential, of course, to provide some kind of a guard for the saw.



FOR posts placed into the ground, the best preservative is crecoots. This can be applied by boring a small slanting hole in the base of the post just above the ground and filling the cavity formed with this liquid. The hole then is stoppered with a small plug! Three or four days later more crossots is added and the hole again plugged. At the end of a week final addition is made and the plug permanently fastened in place.

Wood that has been darkened can be bleached, as well as naturally dark lumber such as walnut. Ordinary leaching powder, which also is known as chloride of lime, is mixed with water to form a thin paste. This is applied to the wood and player to dry. The dry paste then is montened with diluted hydrochloric acid made by aduring one part of the acid

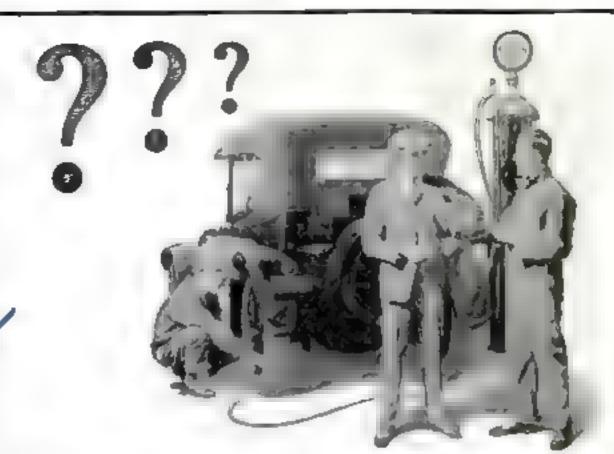


to three times the volume of water After a few hours, clean the wood. If it is not sufficiently bleached, repeat the process.

Certain precautions are necessary when two pieces of wood are to be joined by glue. Carpenter's glue should be broken into fine pieces and soaked in cold water. Never add hot water as it will prevent the glue from aweling throughout its entire mass; just the outer layer will dissolve. Use just sufficient cold water to cover the glue. After all particles of glue have mak to the bottom or stuck to the side of the vessel, a little more water is added so that all the glue is submerged.

After soaking about 10 hours, the glue is heated to just below the boiling point—so that it will melt. Never boil the glue; joints made with hoiled glue never will be as strong as those joints united with glue that has been heated just enough to make the jelly fluid.

Glue, when it hardens, becomes brittle, and since flexible glues are required for certain types of work, such as regluing the bindings of books, glycerine is added to the glue. The quantity of glycerine added after the glue has been malted in the ordinary way asually is equal to the weight of the dry glue used. The glycerine is stirred in after the glue has been liquefled.



# "Have you plenty of patches for your 5-Minute Vulcanizer?"

You know what a joy killer a puncture is especially when you're on a country road and your spare has been used. Ford or Packard it happens to any car. Nor is it less likely with balloon tires.

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You and 3,000,000 other motorists got the Shaler Vulcanizer because it is the quickest and easiest way out of such an emergency. Be sure you are not out of ammunition to use with it.

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Why YOU Want

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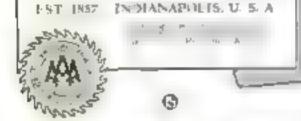
It is two-way taper-ground by Atkins patented process to make it cut easier and quicker.

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# ATKINS SILVER SAWS

# The Rome Wastering

#### Hooded Cab for Model Locomotive

Sixth Article on Building a Miniature Railway

BROADLY By Edward E. de Lancey speaking there are two types of cab for an electric la light cigar-bound the central type with hooded ends. The former was illustrated so fully in the rough article of this series (June issue, page 16) by 31 in. with

that nothing further med be all about The hooded-end less motive clustration not, strictly speakers, a model

for a true moder must eproduce

not only at essential details, but must be made accurately to again. This does neither, but are defects are such that only a person familiar with its New York Central prototype would be likely to detect them.

You may start with a built-up under body similar to that in the fourth article. In this case, however, you must omit

the heavy bumper beams needed for the car-type of body. Substitute light end pieces as illustrated below. Do not forget the little slots near the left-hand side of each end. These are for the uncoupling levers to be described later.

Another variation from the basic construction previously described is in the location of the reversing and control switches, as the cab is smaller and has windows in different positions.

The central cab is 8 in long, 5 in wide, and 4 in high. The outside surface of its sides should come precisely flush with the outside of the under-body sills.

The in by in molding strip over the sills should be omitted in this locomotive.

The best material for the cab and hoods

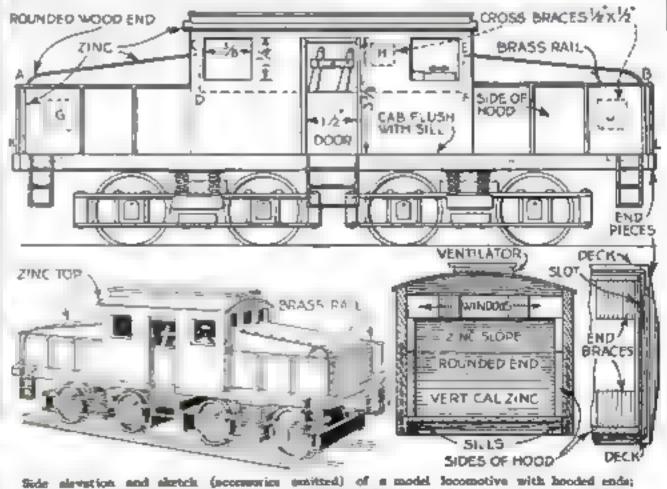
is light cigar-box stock, approximately 14 in thick. It must be straight grained, any and free from warp. For the sides of the call, select two such pieces, 8 in long by 3 in wide. Pasten these together temporarily with light brads or pins, and see that all edges are square and match

exactly. The two outside surfaces of these pieces will be those of the flushed cab, therefore, in anticipation of future painting, give them a smooth, dry finish with sandpaper. Mark out the windows and doors as shown and cut them with a fret- or coping-saw, after drilling a small hole at diagonally opposite corners of each space for an opening

As the superstructure is to be a single continuous structure from end to end, both sides of each hood are continuous from A to B. These, when finished, will pass traids of the cab walls, as shown by the dotted line C-D-E-F. Beyond the man cab ends the hood walls will leave a

mesh cab ends, the hood walls will leave a narrow strip exposed to represent the wider deck of a real locomotive, as marked on the partial plan view. These two pieces will range from 2 to 2% in high and will be 17% in long. Fasten them together and naw as in the case of the two sides of the cab. Fasten the

hood sides firmly with small, sharp head-(Continued on coar P5)



#### The Home Workshop

#### Cab for Model Locomotive

CONTRACT COST AND

He certain that the two pairs of sides are exactly equal in length, that the cab is precisely in the middle, and that each pair is at the proper distance from the ends of the under body. Block them firmly in this position, and see that the outer surfaces of the cab sides are truly flush with the outer edge of each body sill. Now cut three 1/2 by 1/2 in, cross braces of such length that each will fit exactly between the inside edges of the two pairs of sides.

The positions of these cross braces will probably interfere least with the controller and reverse switches if they are placed near each and and near the middle. The detted squares G, H, and J show good locations. Fasten them to their adjacent cab, or hood, sides by means of fine round-headed brass brads.

THE covers over the hooded ands may be made of sheet sine, as that metal is pliable and easily handled. Cut two sheets of such width as just to cover the distance between the outer edges of the honds, and make them long enough to reach, with all bends included, from K to C, and from L to E. If they should be a trifle too wide, in spots, it is an easy matter to true them up with a fine flat file after they have been fastened in place. In the matter of length, 7% in will be correct enough to enable you to trim off any excess that may prove to be unnecessary

Make them accurately square at all corners, and see that the top ends fit closely between the cab corners at C and E. Remember that the sine extends about 1/4 in into the cab at this point and is level under the three end windows. This level stretch is to support the window spacers. Do not overlook the two extremely fine wood screws by which the spacers are secured. They are placed 1 in, each side of the center line.

When both sinc covers have been brought to a good fit, acratch a straight line along each side, so that it comes exactly over the middle of the thickness of the sides of the hoods. Now drill a series of small holes along this line, just large enough to admit very fine round-headed brass brads. Space these holes not less than 1/2 in. spart, else you will be just to split the wood

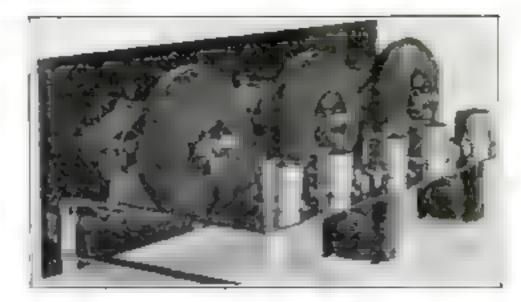
Your superstructure now virtually is complete. Couplings, steps, hand raise, and ventilators will be left until the next installment.

installment.

ten it.

# Heavy Duty Clothespub CLOTHESPINS for blankets, rugs, and other heavy fa t cs, may by made as shown first piace the narrower slot over the material; then pull the pin around and fas-

A novel clothespin



# Amazing new receiver

NOW anyone can build it in an amazingly short time this new easy way. Experts assemble it at factory. You sumply wire. Note revolutionary new principle it contains.

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This feature follows the discovery of a new inductance principle that overcomes many vital weaknesses of present day sets. It consists of an entirely new type coil called the Erla "Bailon "Circloid.

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ordinary sets with volume enough on the loud speaker to fill an auditorium.

3. Increased telectivity. Circloids have absolutely no pick-up qualities of their own. Only signals flowing in the entenna circuit are built up.

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Just as sure as "Production Talks," you'll make your machines Speak Up on



The amail Revolution Counter below registers one for a revolution of a shalf, recording a machine operation

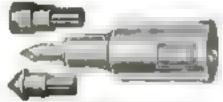
or product. Though small, this counter n very durable sta machanism will



stand a very high rate of spend, makingit especially nustable for anglit faul-ranging machance and most adaptable to esperumental work If run backward the counter sub-Small Rotary

\$7.00. (Cut 4-5 ates.) Ratchet Counter, to register reciprocating movements of small machines, also \$2.00.

Here's the handlest instrument for finding revolutions-per-minute of a shaft or flywheel You hold the tip of the counter against end of revolving shaft, press lightly when the second band of your watch comes to O; release pressure when musule is up. A spring clutch controls the recording mechanism.



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FREE: The 80-page Veeder booklet of Counters, to help in your decalopment-work.

The Veeder Mfg.Co. 44 Sargeant St., Hartford, Conn.

#### Quickly Made Holder for Door Work

THENEVER you have doors to hang or refit, you will find it saves time to nail together a doorholder like that illustrated. It grips a door firmly while it is being planed and mortised for the hinges.

A piece 1 by 4 to. By 2 ft. ione, not too still, is malled at each and to "two by fours," as shown. Two pieces of joint ends about 12 is long ato just on the hevel and nated from underneath to the 1 by 4 of beards A hirsde experience will show you have much space is needed between them / I find that ly-in, clearance is all that is necessary-24 in, for doors 14 in thick. The weight of the door bends the I by 4 in. piece and causes the joint ends to grip the door securely. On lifting up the door, it is released at once

When planing a door, carpenters often cut a board between the door jambs and make a notch in it to receive the door, but

that method acratches the woodwork and blocks the doorway and therefore is not as good as using a holder, - R. M. REKERT, Regina, Sask., Can-

#### Vacuum-Cleaner Motor Runs Small Machines

Dy O. II. Lovejoy

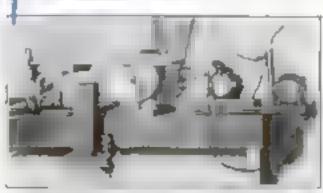
24 15 11

Y HOME "ma constructed fr cleaner, crant / / pieces. The purpor de la consultation of the CITCLIANT NEW AND A STREET OF STREET undum and a second of all consulting

The a property chourd to a bock with two rus of pa dn Wales fit and athed by the themb-screws of the old dust hag. The switch in the end of the cleaner is Instened to the end of the bench to be accessible for all work. A tin-can lid. perforated and

bolted tight against the stone, serves as a pultey wheel for belting the grinder to the

The mandrel is a piece of old curtain rod % in. in diameter, set in an upright



The mechine as set up for sawing. Only the are and the hather belting were purchased

of the blade are the square puts on the ower end of radiator bolts of a Ford car The platform of the saw is a piece of 36-An soft pine pivoted between the prongs of the old cleaner handle. The saw was allowed to cut its own groove in its table,

which is lowered and elevated by a thumbscrew of an old bolt working against a vertical piece of steel acrewed to the base

The lathe, which le shown turning out a vermilion wood tray, is obtained by fastening & small iron plate with a nut on the mandrel. Two screws

pass through the plate into the back of the block to be turned. The rest for the turning tool is merely a "T" of two oak pieces fastening to the front of the bench by a small vise. The turning tools are small tiles shaped at the end.

The motor block is slotted, so that the two long motor screws may be adjusted to tighten the belt. The mandrel block is really two blocks interlocked at right angles and fastened to a stationary base.

It is surprising what clean work the device turns out and how really powerful the little motor proves. The only money spent in setting it up was for the circular saw blade and a length of sewingmachine belting

-----

The mandrel with inceplate attached, being used for turning a tray of vermilion wood

oak block, with a bushing made of a hollow curtain rod. This bushing is fitted into a hole bored through the block. The pulley on the mandrel is one of the wheels of the old cleaner with a groove sawed to take a belt of the sewing-machine variety.

As the saw had too large a bore, an ordinary iron washer was fitted into the hole. The retaining plates on either side

EVERY home worker will find helpful auggestions in a series of articles, "How to Fit Up an Unfinished Attic," the first of which will appear next month. The series will be a veritable textbook on house woodwark.

#### The Home Workshop

#### "Hard Edge" Upholstering

(Continued from page 74)

stitching through not to catch any of the coils of the aprings. Make two complete rows around the edge of the top surface and take a few stitches through the

To produce the so-called "hard edge," first remove the tacks holding the burley, and carefully retack along all four rails. Keep about 14 in. from the top edge. Draw the burlap down smoothly so that the edge remains even. Work from the center toward the legs and at the corners remove any surplus burlap, fold the edge under, and tack close to the legs.

Use a 6-in, curved needle with stitching twine and take several rows of stitches, as shown in Fig. 6. Begin at the left-hand end of one of the rolls by inserting the needle into the edge at a point from 1 to 134 in. above the row of tacks. Let it come out at about the same distance from the outside row of top stitching that was put in previously. Insert the needle again about 2 in, to the right of this and about 34 in, from the row of stitching and allow it to emerge about even with the top of the rail.

INSERT the needle again at a point about 2 in. from where it came out and on a line with your first stitch; then pass up at a distance that will bring it on a line with your first top surface mitch. Continue in this sigsag manner until you have gone around the four sides. It might be well to try several stitches first before drawing your twins up to shape.

The object of this stitching is to draw the stuffing out toward the side so as to maintain an even edge and hold it there by the stitches that pass through it. When a complete row has been made, a second and a third may be done.

During the making of the rolled edge it will be necessary to "regulate" as you go along; by this is meant, drawing enough of the stuffing up to the sides so as to fill out any irregularities that may occur in the roll. This is accomplished by means of the stuffing regulator, or your needle may be used. Force it through the burlap at the point where you wish to fill out the edge and scrape and pull enough of the stuffing to the edge to give the desired shape when the twins is drawn up.

The second and third rows of stitching are made with shorter statches and are not in the gigzag manner, but merely pass through the corners. The needle always m inserted at right angles to the edge, as this helps draw the stuffing into the roll.

The center now is filled up evenly with moss, tow, curled bair, or kapok and a piece of sheet wadding or several layers of cotton batting are placed on top of this. The whole then is covered with number, as in Fig. 7. The corners are folded in carefully and the edges tacked close to the rabbet in the rail.

The final cover is put on as illustrated. in Fig. 1. Soft material, such as cretonne, velour, or corduroy, should be used in preference to leather

A piece of black cambric usually is tacked over the bottom along the rails.



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Visitors from foreign countries invariably wonder at the number of telephones in America. "Why is it," they ask, "that nearly everybody in America has a telephone, while in Europe telephone service is found only in a limited number of offices and homes?"

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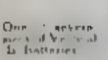
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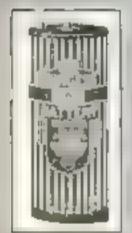
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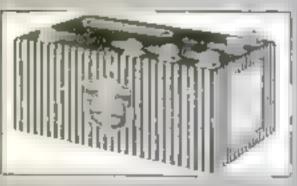
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#### Simple Method of Making Inlays for Your Homemade Furniture

By William Rodgers

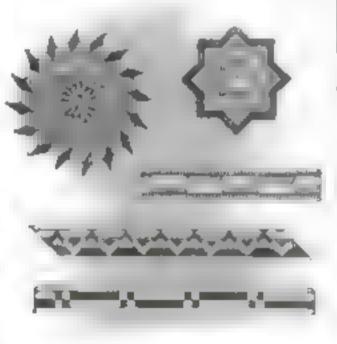
THEN you have a radio cabinet, smoking-stand, small table, or any other simple piece of furniture to build, why not try your hand at forma-

menting it with inlaye?

Contrary to the bellef of most smateur woodworkers, inlays can be purchased quite cheaply and spaced end; it is you do not know where to purchase inlays, send a stamped, self-addressed envelope to the Information Department of Popular School of Mountay, which will furnish you with a list of dealers, or, better still, because more interesting, make your own inlays. You will find you can do it with a degree of success that will be quite surprising.

You will need first two 2 by 4 in. by 3 ft. blocks of wood, one side of each being

The porders are made of veneers, which are stinly sheed or sawn sheets of wood, Various woods are used, such as holy, walnut, maharany, vermilion (or paduk), ast rwood, and ebony. These are sup-plemented with red, blue, green, and black dyed reneers. Ordinary vencers of valous thicknesses can be purchased from some lumber dealers and practically all veneer factories; dyed veneers can be obtained from dealers in inlays. It is, of



Ornamental units and borders bollt up by the method illustrated in the adjacent drawings

course, a simple matter to dye white veneers any color with penetrating wood stains. Let the sheets dry thoroughly before attempting to cut or glue them

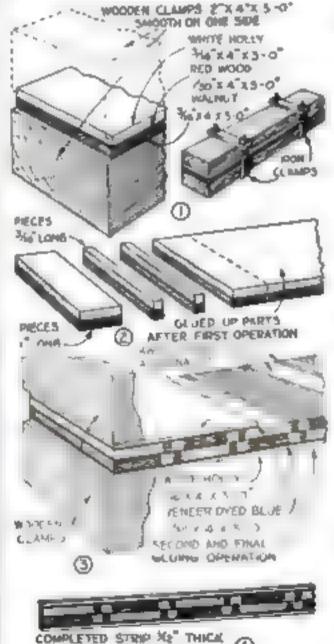
To make a border such as shown in Fig. 4 of the accompanying drawing, take one piece of walnut 3/16 in. thick, 4 in wide and 3 ft. long; one piece of white holly of the same dimensions, and one place of redwood 1/30 by 4 in, and the same length. Lay the white holly on the smooth side of one of the gluing blocks and apply freshly made cabinet glue or the best quality of liquid give freely with a brush all over it. Place the red wood on top and apply glue on the upper side. Then lay the 3,16-in. walnut strip on top, place the other "two by four" on top of all and clamp the whole together.

After the glue has set for at least six hours, you are ready to cut up this 8-ply strip in a miter box. If you have no miter box, you can quickly make one of wood, because only a straight, square cut is needed. Tack a small piece on the base of the miter box one inch from the saw alot, so that you can out quickly a number of pieces—eay 27—each I in, long. Then move the stop and cut a similar number

5/16 in long (Fig. 2)

On one of the gluing blocks, lay a sheet of white holly 1/16 by 4 in. by 8 ft., coat

(Cantinued an bace 99)



The four steps in making this simple border are typical of all geometric inlaid work

ALL DEATH FIND INLAYING

smooth. These are for gluing blacks. They should be provided with two Ushaped from clamps threaded to take nuts as shown and two pieces of 1/2 in. flat iron drilled to fit over the ends of the clamps. Common iron C-clamps, if large enough, or cabinetmaker's hand-screws may be used instead of the special clamps, but are not quite so convenient.

#### The Home Workshop

#### Method of Making Inlays

(Continued from page 96)

with glue and place on it a piece of blue veneer 1/16 by 4 in, by 3 ft. Tack a small place of any kind of wood across one end and against it place one of the 1-in. long 8-ply pieces previously made Against it lay one of the 6/16-in. pieces, taking care that the boily goes against the walnut, as shown in Fig. 3. This must, of course, he well glued to the 1-in. block and also to the blue veneer. Now lay another 3/16-in. piece, then a 1-in, piece and so on until you have gone as far as you can. Tack a small strip tightly against the last piece so that the strips will not separate. Apply glue over the top, lay a strip of 1/30-in. blue veneer next, and then another piece of 1/16-in, holly Lay down the other "two by four" and clamp the whole together. Let this stand at least eight hours.

All you now have to do is to cut your block up langthwise into stripe. You can suit yourself in regard to thickness. As a rule, borders are cut 1/12-in. thick, so that out of this piece, if a ft. long, you will get about 66 it. of inlay 1/2-in. wide.

It is obvious that the same method can be used in making inlays of countiess different designs. By making some of the cuts at an angle, it is possible to introduce angular .ince into the pattern, as shown in the photograph on page 98. In exactly the same way geometric inlays for the center of drawer fronts, table tops, radio cabinet ends, and similar uses can be made.

TO LAY a border, use a marking gage to mark lines in the correct location. Make them a trifle closer together than the width of the border. Draw a sharply pointed knife over the lines, cutting them to a sufficient depth, and remove the wood with a small thisel. Do not make the groove as deep as the border, which should stand out a little when in place.

Cut right-angle corners at 45 degrees in your miter box. Lay the border strips tightly with plenty of glue. After eight hours or more, the surface can be planed, scraped, and smoothed with fine sandpaper

If the piece is to be stained everywhere except the inlay, shellad the inlay first, so that any stain getting on it accidentally. can be removed before it has a chance to penetrate. Apply wood filler if pecenary, and then finish with shedge or varnish or both, rubbing the coats down with pamice-stone and finally with rotten-stone.

WHEN a varnish stain of a special or unusual color is required, it can be made by coloring a good grade of clear varnish with a strong solution of dve dissolved in turpentine or benzol. Strain the dye before adding it to the vernish, and do not add enough to make the varnish noticeably thin. If a very dark color is needed, it probably will be necessary to dissolve the dry stain directly in the varnish, afterwards discarding any sediment.



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# Rounding a Board's Edges

By Emanuel E. Ericson, Noted Manual-Training Authority



Planing. Hold your angle if the bottom is corrugated. Tilt the plane with each stroke to prevent making a flat bevel on the board. Coarea shavings may be taken at first, then finer ones



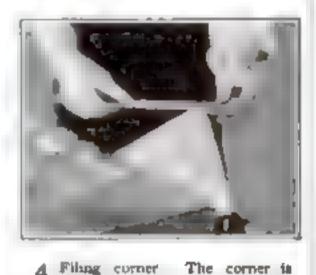
3 Chiseling rounded corner. The wood on a rounded corner or other curved surface is best removed with a chisel. The principle is the same as with the plane on the straight edge. Have your chisel

as keen as odstone and leather strop can make it. If the curve is large, a spokeshave is used.





Tear sandpaper with the rough side up over the bench corner or any sharp edge



smoothed with a fine wood file

not a ramp) after the planing and

cheeling are done. File on the

pushing stroke and lift the file com-

ing back. The file is not used on

the straight edges, but it is an

invaluable woodworking tool for

finishing curved surfaces and shapes

The sandpaper is held over a soft wooden block. Change the angle with each stroke and do not work over the pencil line until the last

#### The Home Workshop

#### A Child's Playhouse

(Continued from page 75)

however, to make a small door, using either doweled or mortise-and-tenon joints, or even butt joints nailed with 20-

penny finishing nuils.

The framework is made almost entirely of rough 2 by 8's and 2 by 4's except the floor joists, which are 2 by 6, and the ridge, which is either 2 by 6 or 1 by 6. The floor beams are notched to take the 2 by 4 in ails and then laid directly on the ground and carefully leveled. The method of framing is shown in detail. In some places, as alongside the windows, it is necessary to nail 1 by 8 or 1 by 2 in. filling pieces to the stude in order to provide an edge against which to nail the wallboard, if the application of the wallboard is left to the very last. The wallboard can, however, be applied before the inside door and window facings are nailed in place, so that the latter go over the rough edges of the wallhoard. In that case, the window and door jambs will have to be made wider than shown by the thickness of the wallboard

LAST of all, the baseboard should be nailed against the wallboard at the floor line. If the joints between the ceiling and the wall in the corners or elecwhere are not tight, they can be concealed by 14-in, quarter-round molding or any flat strips such as can be made by ripping lattice lath in half. It is so easy to cut fiber wallboard cleanly and accurately with a fine saw or a sharp penknife, and joints can be made so neatly, that in a playhouse of this kind no covering stripe or moldings are really necessary

The lumber required for the framework in 175 lin. ft. 2 by 8 in., 200 lin. ft. 2 by 4 In., 100 iln. ft. 36 by 2 or 36 by 8 in., 7 per, 2 by 6 in. by 6 ft. for floor joists, and 100 lin. ft. 36 by 10 in, roofing boards.

All this is rough lumber.

For the walls, 275 iln. ft. of 34 by 6 in. drop siding is needed; for the roof, & bundles of wooden shingles, laid 4 in, to the weather. Composition shingles or roll roofing can be used, if preferred. Regular tongue-and-groove flooring 1/4 by 2 1/4 in. is used, 65 sq. ft. being required For the inside walls, 200 sq. ft. of fiber

wallboard is ample.

The finishing lumber, which should be surfaced on four sides, will vary considerably, according to the number of windows and the closeness with which the work approximates the trum in a real house. If the house is made as shown, the following will be required: 100 Hn. ft. 1/4 by 234 in.; 60 lin. ft. 36 by 3 m.; 100 lin ft. 1/4 by 4 in ; 60 lin. ft. 1/4 by 5 in.; 20 lin. ft. 2 by 8 in., for making window-sills (or regular window-sill stock); 1 pc. 34 by 6 in, by 2 ft., preferably hard wood, for door-sill; 30 ft. 1/2 by 11/2 in. water-table molding. One roll of building paper, nails, hinges, door-lock set, paint, and varnish, also are required.

If the sash and door are not purchased ready made, sufficient 1 }; in. stock in needed for their rails and stiles, as well as a sheet of plywood and window-glass.



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# tter Shop Methods

(Continued from page 82)



By F. J. Wilhelm

OE, just starting to drift a lot of brass castings, had progressed no farther than his first hole hen there

was a clatter and, a bang easting, withch h had been fording by hand on the drillpress table broke from his gap. spunja ound could stop the spindle, the drill snapped and the easting bounced away. A characteratic Monday morning start for Joe

Has foreman, who was making his early rounds. saw the mishap and

inquired why Joe hadn't clamped the job on the table.

"Well," Joe explained glibly, "I thought it would take extra time and I tried to hold the casting with my hand. It went all right until the drill started to go through. It jumped so quick I couldn't hold it and it got away from me."

"Let me see the drill you were using " The foreman glanced at the cutting edge. "Get another drill," he said, "and I'll show you how to grind it for brase."

Joe brought another drill from the crib, the foreman stepped over to the emery wheel, touched up the edge and handed the drill back to Joe.

"You will see that I have ground the cutting edge flat; that is the way a drill chould be for brase or bronze. You can't cut these metals like steel or iron. They have to be broken up and that is just what the flat edge is for-and to prevent the drill from digging in. Try that now and I don't think you will have any further trouble. But use a clamp on the job."

Figure 1 shows how the drill was ground Most men think of a drill press as a machine simply for drilling holes, yet a drill press is a close rival of the lathe in doing stunts. Like the stunts performed by a circus elephant, many of them seem incongruous, but they are useful in many small jobbing shops and even in some of the large manufacturing plants where a drill press occasionally will be rigged up for some special job for which it never was intended.

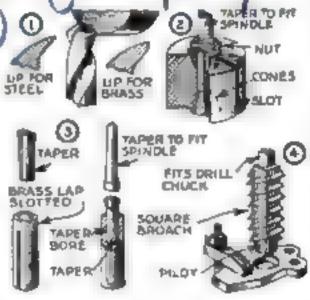
Lapping holes in hardened-steel dies and in engine cylinders may be done in the drill press. Two forms of laps, Figs. 2 and 3, are useful. It is even possible to do some kinds of work with a lanmade by wrapping a piece of emery

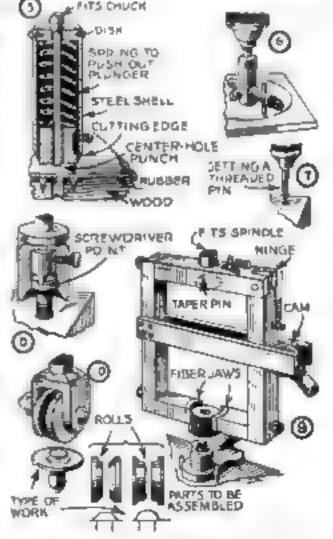
cioth around a stick (Fig. 14).

Afrongh-and-ready substitute for a disfilite machine for dies having circular contours for round corners is a drill press

To cut large circular holes in plate ass requires nothing more than a short

steel shank with a wooden plug on one end and a plece of brasa tubing (Fig. 15). The plug fits snugly inside the brass tube, is charged with emery and water Only hight pressure is needed to cut a clean hole through the glass without chapping the edges Figures 7 8 and 9 are suggestive of how a Comtened on page 203)





Methods of using a drift press for special purpowers, when the shop equipment is similed



#### letter Shop Methods

#### How to Make the Most of Your Drill Press

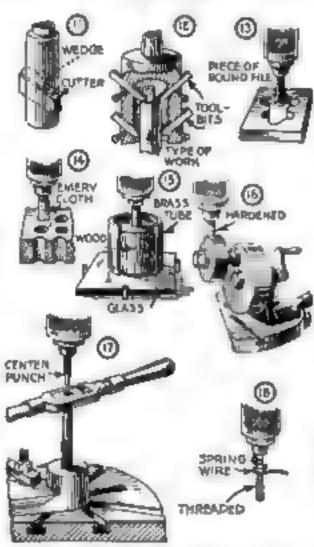
(Continued from page 102)

friction drive drill press may be used for assembling small parts. Among these operations are driving small stude and screws, and spinning rivets, as in Fig. 10.

Light broaching operations are feasible (Fig. 4) if a broach of conventional type is made with a shank to fit the chuck or

Two methods of cutting washers from rubber, felt, fiber, and similar relatively soft materials are indicated in Figs. 5 and 8

Tapping holes with a drill press is made easier if a center punch is pressed



Using a drill press for boring, filing grinding, lapping, tapping, dristing glass, and making springs

against the end of the tap as in Fig. 17, while the tap is turned with the wrench. This insures starting the thread squarely with the hole and lessens the danger of breaking the tap.

A simple method for locking cutters in a bar for spot facing and counterboring is shown in Fig. 11

Figure 16 suggests a method of using a small hand grinder in connection with a drill press

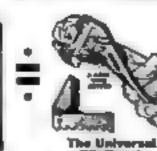
When a spring is needed in a hurry and all the lather are husy, it is possible to grip the spring arbor in a drill chuck, as shown in Fig. 18. Start the wire in the usual manner and guide the pitch of the apring by hand.

How a box-turning tool may be adapted for use on a drill press to indicated to Fig. 12.

These all are ideas I have used at one time or another and have taught to many young machinista like Joe, who are not apt to appreciate fully the capabilities of a good drill press.

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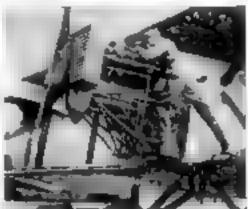


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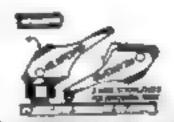
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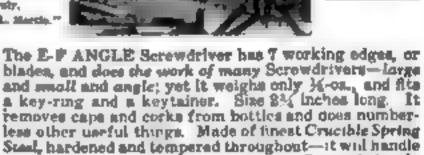
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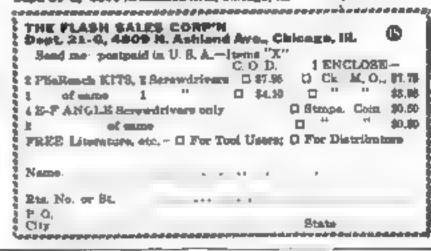


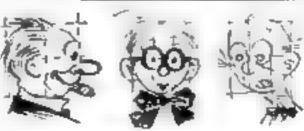
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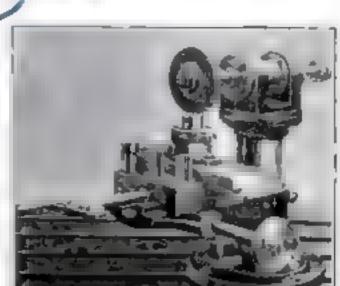
# ter Shop Methods

# New Lathe Tools Have Long Life

OR plain turning and for special set-ups in gangs of two or more tools in turret work, a British angineering company has developed the circular Ath tool illustrated below. The design of the tool is simplicity itself. It consuts of a body holder provided with a freular cutter, which is symmetrical in stape and can be produced by turning. Aside from the special cutting qualities claimed for it, the tool has the addition I advantages of economy in the use of high-speed steel and a leer as in power consumption, a hald mable increase in production, lower tooks om costs, and case in handling and reference.

As the tool can be rotated in the holder, any part of its circumference can be brought into use, as the clearance angle is uniform. For this reason it is said to have a much longer life between grindings than tools of rectangular shape.

The efficiency of this tool in comparison with an ordinary round-noted tool was tested on a light cut 34 in, deep with a 34in, feed. The speed of cutting was 115 ft. a minute, using a cooling compound, on a belt-driven lathe. The round-nosed tool failed after traversing the first 12 in, and was unfit for further use without regrinding. It was noted also that the speed of the lathe was reduced by the resistance of cutting from 115 ft. to 76 ft. a minute. in the case of the circular cutter working under exactly the same conditions, a dis-



The circular cuttur in its holder a curter blank and a flatury for regrinding curters

tance of 12 ft. was traveled by the tool without any noticeable reduction in the cutting speed.

The tools are sharpened only on the top and this is accomplished in a special chuck or fixture on a surface grinder. As the tool wears and is ground down, it can be packed up with suitable rings.

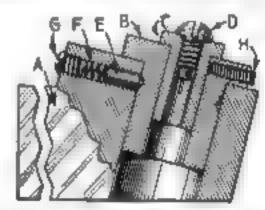
#### Hand-Operated Slide for Small Milling Operations



FOR a improus small sletting derations acrews, bush nga and similar work, a sample hand operated at an adopted for the on an ore nary white machine is photograph shows or that goed regu-The case of the slide in butter to the platen of the primer and the ande is reciprocates by means of the lever attached to the pinion-gear shaft. The slide in rack-cut a sufficient length to allow the necessary movement

The drawing shows the construction of a simple fature for holding a special type of screw D for slotting in four positions, on the quarters. The block A is held in the tool-pocket of the slide by a setscrew. Bushing B is knurled on its enlarged diameter or shoulder for hand manipulation

in Indexing for the four positions. Bushing C is aplit in half so that it will asparate readily to release the screw, which it holds in slotting. A flipper pin E, spring F, and screw G serve to retain and locks bushing B in holder A, and bushing B is



Inducing facture for repetition work with the reciprocating slide shown at the left

spotted in four places for the index. Screw H binds bushing C during the cutting operation.

A stop screw is provided in the cut-off slide to control the length of stroke, With the machine table set in a convenient position, a simple motion of the slide lever only is necessary for light work of the kind shown.—O. S. MARSHALL.

Toot steel can be unnealed with water. Heat the piece slowly to a dark red, take it out of the fire and hold in the air until all the color has disappeared that with a match-sitch of any piece of soft wood. It the wood does not moke the steel can be depried into cold water. steel can be dipped into cold water.

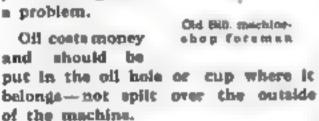
#### Better Shop Methods

#### Old Bill Says-

TOU like to find a clean machine when you start a new job; remember this and ofter you have finished, wipe up the markine for the next man.

When daill very hard steel use jurientine in stad of oil.

by to find the Rest way to do erything; it makes your work like a game in which you always are matching your wite against n problem.

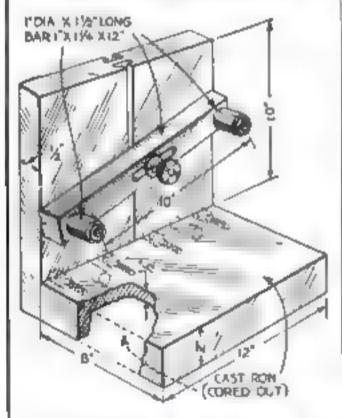


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#### How to Construct a Sine Bar for Large Angular Work



HIS gine har for obtaining angles accurately is of especially beavy construction. It can be adjusted quickly and will hold its actting. If he angle relate is made in two sections had together with dowels and screens. The seces are ground on all sides before their are assembled. The Philots in the vertical plate fllow the sine for to be used on either ade, thus providing a wide range of adjustment.-H. L. Wheeler.

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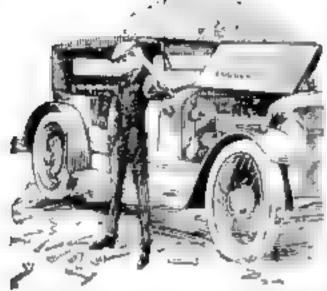
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# Better Shop Methods

### Cooperation between Draftsman, Pattern-Maker, and Foundryman

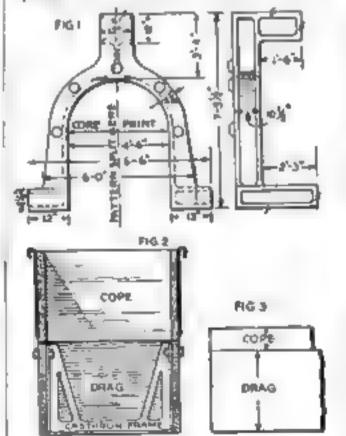
By M. E. Duggan

NOOPERATION among the different department heads in a shop goes a long way toward smoothing out the rough Whether some of these rough spots that nearly every mechanic encounters at times in his shop experience, are the resuit of builheadedness or just plain indifference, I leave to the individual to judge. In my own case I have seen many shop problems where the right sort of cooperation could have saved hundreds of dollars and much needless worry

and haste.

While on a visit to a foundry a while ago, the superintendent asked my opin on as how test to mold the patterns shown in F is 1, below 1 studied the pattern from every a same arminally decided on just one way a to redesign the custuages that it could be cast in a "flat back oppe" flack, as in Fig 3.

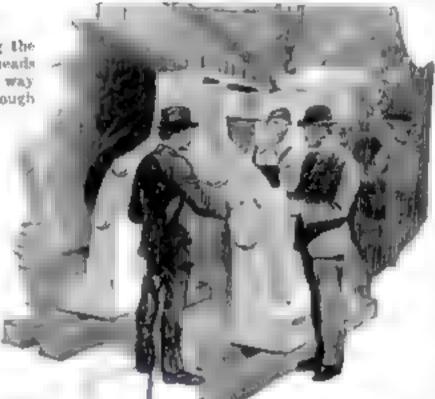
The paper mandent, however, decided to the the pattern as it was, on account of the small number of castings needed. The special flask shown in Fig. 2 had to



A costly special fluid instead of an ordinary one was required for casting this pattern

be made at a cost of \$120 to moid the pattern on its edge, as in the side view, Fig. 1.

Was that expense and trouble necessary? Absolutely no. A slight change in the design, which in no way would have affected the strength or the purpose for which the casting was to be used, would have made possible the molding of the pattern on its side.



The expension ferroles who have a set y for short.

As we expense a quite it up a big partern.

's good molder can mold any pattern provided it has 'two ends on it,' 's as common saying among foundrymen. However, cooperation in the drafting-room, the pattern-shop, and the foundry, and an occasional visit to these departments by the draftsman will give him a better understanding of how the work is done and will suggest ways in which he can use this information to his own advantage and to the interest of the company. He will be better able to make drawings that answer the requirements of both patternmaker and molder without sacriftcing strength or design

THIS is the last article written for POPULAR SCIENCE MONTHLY by Mr. Duggan, who was rejarded for at least a quarter of a century before his death as one of the foremost pattern-makers in the United States. In this message to mechanics he emphasizes again a theme that he believed to be of the utmost importance in every shop. He held that every mechanic and, of course, every engineer, designer, and draftsmen, should make a determined effort to understand the other fellow's problems. Only through such understanding is real cooperation possible.

It is true that in this article he points out a defect and does little more than intimate the remedy the redesigning of the casting. Probably the casting could not have been redesigned without the making of an entirely now pattern at a cost in excess of the building of the special flask. Forhaps, too, the element of time was exceedingly important, 44 it so often is, and the superintendent felt obliged to get the centing made without delay at any coat. But no shopman cen fail to agree in Mr Duggan's fundamental proposition, that the more we appreciate the problems and the difficulties of the other fellow's job, the better we can do our own.

This seal on a radio or tool advertisement signifies the approval of the INSTITUTE OF STANDARDS. See page 17.

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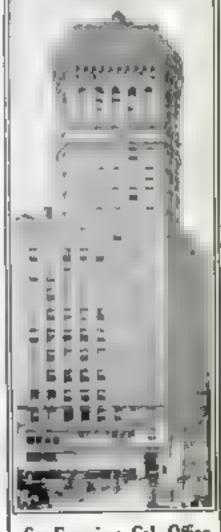
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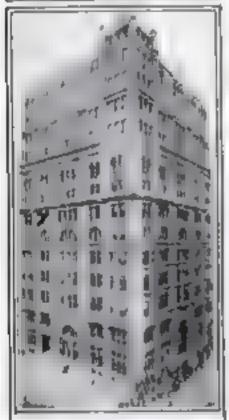




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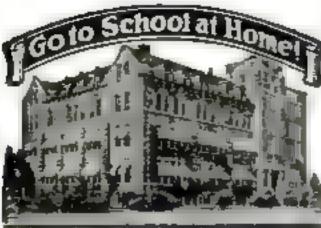
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## Better Shop Methods



#### New Clearance Gage Aids in Grinding Milling Cutters

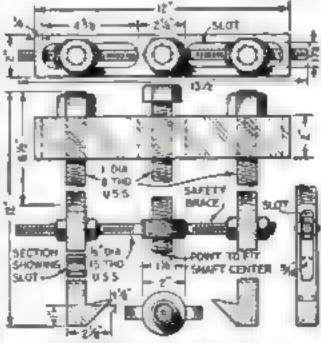
TO AID in grinding the street angle of clearance in milling cutters, the gage illustrated above recently was perfected. The V-shaped body is praced over the cutter and holds the raging blade in correct raint on to the center line. The culter is rear ved astiiciently to bring the face of a took in contact with the blade, when upon the angle of the clearance in the tooth should correspond with the angle of the gage. The gage serves for both right- and left-hand cutters and for and-mulls of all styles from 14 to 8 in.

#### Cross Brace Prevents Gear Puller from Slipping

BUILT for heavy duty the convenient range of adjustment and is previded with

a brace that pros of a thirty trace ing di the pates whenever that might beliftely to happen In diffior R and awkward Work. The clongated slots in the hormontal and vertical members





The gear poller to use showing application of cross brace, and details of the tool

will allow quick adjustments to be made. To make one of these pullers requires little machine work except drilling and tapping. HARRY M. CORNWELL.

#### Micrometer for Setting Boring-Bar Cutters

WHEN setting the cutters of revolving boring bars it is desirable to have some method of accurately determining the projection of the cutter from the bar. The accompanying illustrations show a micrometer devised by the writer for this purpose.

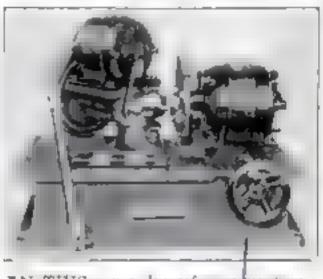
The upper view is the assembled device. A standard 1-m micrometer head is mounted in a clamp that has two prongs or forked points. When the micrometer reading is .000, the three points are in line. Therefore, if the two outside points



are placed on the boring bal and the mi-crometer adjusted until the movable anvil just touches the catter, the exact projection of the cutter will be mown. The size it will cut then is determined readily at the sum of the projection of the cutter and one-vall the diameter of the cutter and one-vall the diameter of the for will the radius of the hole bored

In the lower view the construction of the forked clamp is shown. The body is made # 11/16-in. cold-rolled steel, the two prough of M-in. cold-rolled steel, and the clamping lugs of mild steel. These parts all are welded together and finished as shown. A clamping screw with milled head is provided to hold the forked clamp on the micrometer head.—EDWIN KILBURN

#### Two Motors Drive Sturdy New Valve-Refacing Machine



N THIS new valve-ref. g ra b to a LOUST this and Value Contare 3 the use of two electric protocolinatesed of one. While one of them drived the grinding wheel at \$150 re chuljons a minute the other carate the work spindle Peropple 4 sear reduction at a speed of 480 rever thes

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all auto valves, are provided

#### Factory-Made Vegetables Our Future Food?

(Continued from some 21)

"Possession of the ultra-violet ray is the thing that has made it possible for us to succeed where previous generations have falled. For a long time there has been theoretical knowledge that the resteration of energy could be reproduced within our laboratories by the use of high temperatures, but from a practical standpoint the thing is impossible, for the reason that the very heat that could produce the delicate structure also would inevitably destroy them.

"The uttra-violet ray, on the other hand, has the same property of promoting anti-combustional changes us has beat and with the added advantage that it is not

destructive.

"Under the influence of the ultra-violet rays, water vapor and carbonic acid gas are decomposed. The water vapor divides into hydrogen and oxygen and the carbonic gan taken the form of oxygen and oxide of carbon.

"PROCEEDING along these lines," Professor Berthelot went on, "we realise the light synthesis of formic aldehyde, the simplest of the ternary formstions, or sugars. This comes from the combination of paygen, hydrogen, and carbon

"Going one step further, we accomplish the light synthesis of four elements—carbon, oxygen, hydrogen, and nitrogen This gives us the lowest quaternary form, the starch called 'formiamide.'

"In other words, we have thus produced both sugar and starch from the elements without the intervention of living organisms. The low form of albuminoid starch is the beginning of the albuminoids or proteins, and is therefore the base of protoplasms and of living matter."

To scientists, this result of the Berthelot experiments is revolutionary—it is a step toward the possible laboratory production of at least one constituent of the living cell and may aid materially in the dream of all scientists, the production of

life itself!

"Chlorophyll is the basis of our results," said the scientist, continuing his explanation. "This material is the essential element of plant life. It is the thing that gives vegetation its coloring of green. The green pigments enable plants to utilize the light energy of the min for transforming the atmospheric carbon into a higher chemical. Chlorophyll makes life possible. By reproducing the fundamental reactions of the chlorophyil, we are able to create the sugars and starches pertaining to plant structure.

"THE ultra-violet light, therefore, per-mits us to realize, without living matter, but in living form, the same synthesis as that of the plants. In subjecting aqueous vapor and carbonic acid mixture to the rays, by means of a mercury-vapor lamp, I have proved that these two gases combine to give the principal sugare exactly like those of plants. These experiments conducted with M. Gaudechon. show that by means of light, vegetable foods can be manufactured from air gases.

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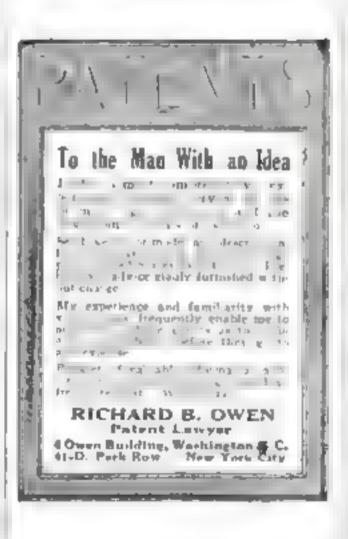
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### Here Are the Rules in Our Great \$10,000 Contest

This Month's "What's Wrong" Pictures on Pages 30 and 31

- 1. Every month for four months, beginning in the June came Popular Science M origin in a number of John and Mary Newlywest Each of these pictures shows John or Mary was a me simple sub-about the bome in an one much way. And in adultion there is a definition there is a desired that the same of liberate error in the drawing of each picture. You are to tell in what two things are wrong in such picture and why they are wrong.
- There are four complete monthly contests, each of eight purpose. The first was a rise fune made, a second was in the July seese the third is in this same on pages 29. 10 and 11 and the last will appear in the feptember uses of this magnine. In addition, there will be a Grand Prior Contest overring all of the 32 pictures printed to the lower months of the contest.
- POPULLA SCIENCE MONTHLY WILL AWARD \$10. 3. 100 in 500 cash prom for the best answers submitted in the contest.

The cash prises in each of the four monthly contests will be so follows:

First Print		-de	-	4		 	ш.	÷			ı		B-500
Second Print						ı		-0			ų		III.100
Third Prise		-						-0	ı	p-	Ţ		\$50
Next 5 Prizes, \$10 c	rack	+	,		į,		_		-	ú	4	+	850
Nest 60 Prince, \$5 (													
Monthly total		ıl-	a	-				В		-0	4	p-	\$1000
Four months' total													\$4000

In addition, each prizes in the Grand Contest will be gold as follows

First Price	\$7500
Second Prise	B 000
Third Prize	8500
Next 5 Prison, 650 each	\$150
Next 50 Priors, \$10 cach	B500
Nant 250 Prines. \$5 coch	\$1230
Total Grand Prizes	\$6000
Total Prices	110 000

#### HOW TO COMPETE

5. In connection with each parties there quenperformed more operigen this release and how so mild the directives of And 25 What either as the artist make in diaming the picture and how so mild wrings. A first diere as there is quickly positive in in the control of the origin and will be used as in basis for the inclection of the prime without. It results all of the controls will be awarded to those in all of the controls will be awarded to those in cost number of the pictures. It is provided, it mever that an between is restants harried the same humber of creek solutions the receivance of a recruit of the pictures. It is provided, it mever that an between is restants harried the same humber of creek solutions the creeking of a recruit is be based about the cases of area. took must be answered contestant.

Answers to each set of eight pictures must be D. received not later than the thirtieth of the month following the date of publication of the magatime in which the pictures appear. This this issure consideration in this must be a contest answers to the eight pictures in this made published July to must reach the office of Purchan Science Most rick not after than Acques July Pictures received by this date will be entered automathically of the Grand Prize Contest also. Contestants, how-ever may enter adoptional answers to eight the Grand Prize Contest and enter for the Grand Prize Contest any time better Sont when Mounties out having entered a most by contest of out having ensered a minutify contest in-testable a security hold the mask of a dictures until they have a complet see. I do be security may be answers the ogen planted however that me much entry was be received after September

#### WHEN SUBMITTING ANSWERS

- Contemporar may submit as many answers as The transformation of the paper of the state of the form of the transformation of the transformation of the same of the transformation of the same of the more of the win of the content of the content of the more of the win of the content of the c
- 8. All entries should be addressed to the Pictura of the field of the tau Science Mescrip v. 250 F with tecture New York of No be and notices of the ent and hunt be well on the discount of the entry with mentionent postage will not be secrived. The publishers cannot be responsible incidency from an non-delivery of entries. No contribution entered in the contest will be returned.
- Principleness in this month's contest will be 9. Prince with the parameter of the parameter of the January forms of Portugal Science & Portugal of the winner of the Polyand of the winner of the polyand of the winner of the winners of the winners of the winners of the correct solutions published as not tous possible after the close of the form one was a contest.
- 10. You pay nothing. Just it we yout knowledge not undervation. You meet not us made Poputan Scip's rid by mist appear in a contesting a copy from a copy of the district a copy from a copy of the district a copy of the district from a copy of the district from the man Science. These part strange open to everybody, except emple were of a copy of the popular are open to everybody, except emple were of a copy on the following the first little of Standards will not no lindges and their facilities of Standards will not no lindges and their decision will be final. Acceptance of them rules is an expression of each entry.

  See pages 30 and 34 of this issue for the third set. See pages 30 and 34 of this issue for the third set

of pictures in this remarkable contest. An additional set of pictures, offering in itself a complete contest, will be published in the September issue.

IF YOU are unable to get the June and July issues of POPULAR SCIENCE MONTHLY containing the first two sets of Contest pictures, copies of these issues are available for your free use at the public libraries or at the offices of this magazine. Or, if you prefer, you can obtain copies at 25 cents each from the Picture Contest Editor, Popular Science Monthly, 250 Fourth Ave., New York City

#### Searching Sahara Sands for a Lost Continent

(Continued from page 37)

Inland the trail of exploration leads through hundreds of miles of desert in search of remains of vanished peoples. Late last spring an expedition under Count de Prorok, and including eight Americans, completed a 2000-mile swing through southern Tunisia, Algeria, and the Sahara in four motor-cars, making a preliminary survey of prehistoric cites

There are certain desert districts of southern Tunisia which, while they have already yielded traces of prehistoric man, at the same time have given evidence that their sands, abounding in fossilised remains, are a deposit of the sea.

IN ALL its explorations the expedition expects to collect thousands of specimens of flint instruments and other objects representing all periods of primitive man.

In the meantime, recent geological study and exploration have aroused new scientific speculation as to the possibility of an altogether different location for the jost Atlantis. At least three developments have contributed to this interest. One is a survey of the ocean floor, which reveals a vast back of land 1000 nautical miles wide, rising in mid-ocean and topped by mountain peaks, the tips of which plerce the surface to form the Azores.

Another in the recent thrilling voyage of William Beebe, of the New York Zoological Society, into the ocean wilderness of the Sargasso Sea, lying between Bermuda and the Virgin Isles. The story of his strange discoveries in this teeming mid-ocean jungle, as told in the May issue of Popular Science Monthly, has added new interest to the legend that this yant expanse of 400,000 square miles was the vanishing place of the lost continent.

A third development is the interesting theory, recently advanced, that the American continent slowly has been drifting westward. This theory, if substantinted, would give further weight to the incution of Atlantis in mid-ocean; for, considered with the existence of such an bland continent, it would help to explain how it happens that traces of early dviluation so similar to that of Egypt have been found in Central and South America. If we imagine America 1000 miles nearer to Africa than it is today. with a vest island midway between as a stepping-stone, it is easy to picture the Atlantides drifting across the intervening waters in small boats.

THE story of Atlantia, as preserved to as by Piato, pictures the vanished continent as encircled by mountains, with a fertile plann in the center. Scattered through the mountains were rich and populous towns, and in the center was a magnificent city, with palaces of white, red, and blue stones. The soil of the plain produced rich crops. In the mountains were mines rich in ores.

Science says that the existence of an Atlantic is geologically possible. Archeologists see in the legend a dramatic an swer to the mysteries of civilized man's origin

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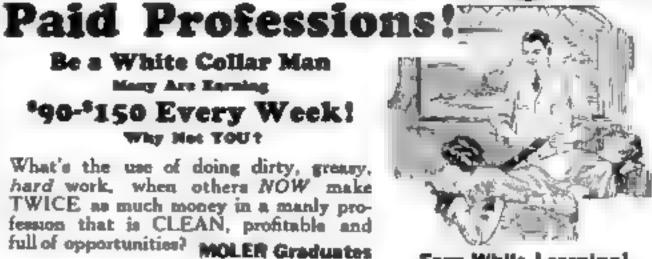
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The tea wagon illustrated stands 28 inches high and has a top 20 by 30 inches. The two drop leaves are 10 inches wide

and hinged at the top. The tray has a glass bottom.

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### **Heats Home** for 25° a Week!

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### Astonishing Things about Your Jewels

(Continued from page 35)

many times, but failed to find the hidingplace of the germs.

At the end of a year and a half the family reached China and the emerald cutter brought his emeralds to America, where he sold them for \$200,000. While he may never recover his properties in Russia, the future of his family was assured by that logful of jewels.

Nine persons in 10, if asked to name the most valuable jewel, would say, "diamond." The fact m, though, that in a table ranking gems in their order of value, carat for carat, the diamond has fourth place. Both emeralds and rubies are much more valuable, while the pearl is far above all others.

The finest pearls come from the Orient. in the Persun Gulf. These have a depth and brilliant richness of color unapproached by other varieties. with a rose-pink color are the most desirable. There are black, brown, aslmon, yellow, bright red, green, and purple pearls, as well as the milky-white variety. They are found in more than 100 different shades.

THAT is one reason for the great cost of a perfectly matched pearl necklace. A dealer cannot go out and buy the pearls he wants. He has to collect them. Sometimes it takes years to do it, and he has to examine millions of dollars' worth.

While pearls are by far the most valued of geme, the most valuable single gem was a diamond. This was the Cullinan diamond, the largest and finest white diamond ever discovered. It was found in South Africa in 1905, in Tom Cullman's mine, the Premier. This crystal, resembling a huge chunk of ice, proved to weigh 114 pounds. It was split into nine separate stones (the two largest weigh 516.5 carate and 809 3 16 carate respectively), and 96 brilliants. The etones can be seen today in the Tower of London among the British crown jewels.

When I said that the prices of gems tomained unchanged. I left out of consideration the effect of fashion which, by increasing demand, does cause a certain fluctuation from year to year. Fashion experts announce that "bracelets of emeralds are now very 'chic' for evening wear," and soon there is a demand for auch braceleta.

FASHION has much to do also with the cutting of jewels. At present the fashion is to cut gems in the square or emerald cut. This follows the general trend of fashion in clothing. Twenty-five years ago curves were fashionable. were round. Today they are obling, and accordingly, prefer jewels cut to match.

Cutting jewels is an exact science today. Until about 15 years ago jewelcutting was left to the skill of the cutter. Now micrometers are used and every facet or side measured with minute exactitude to get the full benefit of refraction of light.

Flaws in the rough stone help determine, of course, the size and cut of the stones taken from it. About two-thirds of a rough diamond to lost in the cutting

It is impossible to cut emeralds or sapphires so that they have no flaws. All have them.

People often ask how to take care of their jewels. Will water hurt them? Will they keep in better condition if worn than if put away?

DEARLS need far more care than any other gem, for they are an animal product that can be destroyed.

An estate was being settled recently and a string of pearls was brought to me for appraisal. I had handled that same string 15 years before and was greatly surprised at its changed appearance. The pearls had worn barrel shaped. Each was long and thin. I made some inquiries and found that the owner had the habit of wearing her pearls at night while aleeping. At night the largest percentage of acid is thrown off through skin pores and this had descrived the pearls.

These particular pearls were restored by peeling. A pearl is made of layers, like an onion, and these auter layers can be removed until the pearl has become round

The peeling process is a most delicate task. It is done with the fingernatic and a sharp knife. Only a few men in the

world know how to do it

Face powder is bad for pearls. It clogs up the pores of the pearl's skin, just as it does those of the human skin. Pearls should be wiped off with a soft cloth before putting them away, to remove powder and acid.

The opal is another gem that requires great care. Made of silica and water, it is very fragile. It was probably because of this that auperstitions of bad luck have been associated with it

Water, as a rule, will not injure precious stones. Dismonds, rubies, and sapphires can pass through fire without injury. It is comparatively easy, though, to destroy both emeralds and dismonds. They will shatter to bits if atruck abarply.

HOW can I ten it jewess of the clever-IOW can I tell if jewels are real?" nem with which precious stones are imitated these days, the more they are asking this question.

Any one can test a pearl for himself Many artificial pearls are hollow glass beads, with a sort of fishecale lining. a product of a small Mediterranean fish These can be detected by rubbing the pearl gently over the edge of your lower teeth. If it is a glass bead it will feel perfectly smooth. If it is a real pearl it will be elightly rough and grating

A Japanese cultured pearl cannot be detected in this way, for its outer structure is exactly like that of a real pearl It is a pearl formed by an oyster about a core of mother of pearl that has been alipped in the shell. One way of distinguishing Japanese cultured pearls from real ones is examining them under a lucidoscope. By means of this machine one can look through the pearl and distinguish the core.

#### Beware of Sunburn

(Continued from page 39)

presence of pigment in the skin aids in transmission of light. That is, after you have acquired a cost of tan, the ultraviolet light can get through your skin, enter the blood, and be diffused through the hody without being stopped on the way to produce a chemical burn.

Recent tests indicate that there may be relief for non-tanning skins in a preparation containing enculin, derived from

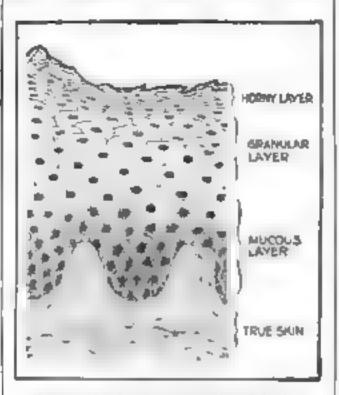


Diagram showing the construction of the skin. The protective pigment that produces ten and frackles in monufactured in colle of the deepest of three sayers forming the spidermis, or outer skin, that covers the true skin. The pigment looks like specks of brown paint and is represented by the small dots in the diagram.

horse chestnuts. This is put on before exposure to the sun.

When you fish or lie in the sun for hours at a time, exposing skin that has been protected all winter, you are inviting trouble. The skin cannot manufacture pigment quickly enough or in large enough quantity to protect you from burns.

Burns may be considered in three classes-first degree, when the skin is simply inflamed; second degree, when bristers are formed; and third degree, when charring takes place. A burn of the first degree, covering the entire body, probably would result in death. A blistering ! burn on half the body would be as severe. and a charring burn on a third of the body, equally so. That is, a superficial burn is as serious as one that blisters, if covering twice the area.

You probably have noticed that you have suffered your worst burns while you were on water in a boat. That is because water reflects ultra-violet light and this reaches your face and eyes, even if they are protected from direct rays of the supby a hat. Some of the light penetrates water, so that you may be sunburned even while ewinaming.

One of the best and simplest treatments for shock from sunburn, is to get into a tub of lukewarm water into which a nound of bicarbonate of soda has been dissolved. A physician always should be called, since beart stimulants may be required to prevent collapse. Any sort of fat helps to sooth sunburn. Either lard or butter can be used in an emergency.



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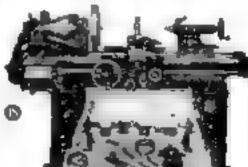
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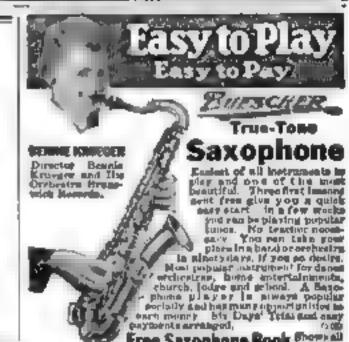
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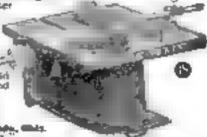


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### Country Schoolmaster Stirs the World

(Continued from page 27)

and thus environment was a large factor in producing new types of creatures.

Scientists, who became convinced of the truth of this theory, held, too, that man took part in this general scheme.

Darwin himself said that scientific facts. indicate that man's nearest kin was the Old World monkey.

"But," added Darwin, "we must not fall into the error of supposing that the earthly progenitor of this whole simian stock, including man, closely resembles existing apes or monkeys. What evolution shows is that the five great vertebrate classes—the mammals, birds, reptiles, amphibians, and fishes—are descended from one prototype—probably a fish."

This theory has been borne out by geological and fomil discoveries made since Darwin's day by eccentrate in many parts of the world. Forail remains found in the rocks indicate, according to the conclusions of science, that in one period of the earth's history its enimal inhabitanta emerged from the sea and became land dwellers.

It is to this theory that anti-evolu-

tionists object. They hold that the earth and its plants and its animals were created as described in Genesia, the first book in the Bible; that to accept the theory of Darwin and his followers is to strike at the foundations of religion.

It was to prevent the further promulgation of this theory that the legislatures of Tennessee and Oxlahoma enacted statutes making it unlawful to teach the theory of evolution in the public schools of those states; that in 15 of the remaining 46 states either unti-evolution legislation has been instituted or other means taken to provent the teaching of the theory in

the public schools.

Evolutionists, however, Insist that to hold the theory offers no challenge to religion or to belief in a creator. The evolutionut, they admit, cannot accept the story of the ark, of the creation of the world in six days or 24 hours, and of the separate creation of man and the other animals. He can, though, they say, believe fully in a creator who made a world in six geological eras; a place in which evolution began and continued.

#### Some Inventions and Discoveries

(Continued from page 44)

according to Dr. Carl Murchison, profemor of psychology in Clark University, after testing the mentality of several thousand criminals and comparing the results with those of tests on army men.

#### New Cars and New Fuels

FRONT-DRIVE automobiles will be the next improvement in motor-case. in the opinion of Capt Eddia Rickentacker, manufacturer and former race driver. Care of this type now being used for racing, show great speed. With power going into the front wheels practically all studies is used to be eliminated. These new care racy be run on ether, or with their derives from molasses, it is reported. E. C. Freeman, chemical engineers decreasing them requires before

neer discussing these possibilities before the Minerican Chemical Society recently, declared that the use of ether would do away with dirty cylinders, since ether burns with no solid product of combustion. Molasses fuel, he added, would give great power combined with smoothness of operation and ease in starting.

Another fuel possibility is a new synthetic alcohol known as "methanol," imported from Germany. It is a wood alcohol produced from coal and water, and is a result of researches carried on in Germany during the war, to find a substitute motor fuel.

#### The Moon Snatched Away?

THE moon was stolen from the earth. A layer of the earth's crust about 41 miles thick and covering two-thirds of the globe's total area was pulled off by the sun's attraction. It rolled up into a ball and became our beautiful satellite. This new and interesting theory was announced recently by Dr. R. H Rastall, lecturer in economic geology at Combridge Univer-

What remained of the earth's crust after this had happened become the continents. According to this theory, if we had no moor we might have no occaze, for these corupy the space once covered by crust. This explanation fits in well with the dean of a German geologist, Prof. Alfred Wegener, who believes that the American contigient originally was united with Surfipe and Africa, and floated away to where it is now. This might have happened when the moon was torn away.

#### An Unnamed New Gas

DURING the recent eclipse an unfamiliar gas was observed about the sun by accentists who were making careful observations. But, according to Prof. Frederick Slocum, head of the Van Vleck Observatory at Wesleyan University, who recently made the announcement, scientists are not yet prepared to name the gas or to discuss its properties.

#### The Next Total Eclipse

OCTOR J. A. MILLER, director of the observatory at Swarthmore College, whose interesting story of this year's solar eclipse appeared in POPULAR SCIENCE MONTHLY recently, is getting ready to journey halfway around the world to the west coast of Sumatra, to observe the next total solar eclipse. It is acheduled to appear on January fourteenth of next year. The narrow path of totality passes over East Africa, Sumatra, and the Philippines.

RASPBERRIES as big as blackberries that grow in the Andes Mountains are surted to cultivation in California, recent experiments have shown.

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#### Insects in Your Back Yard

(Camilland from page 45)

daily to forage for food. A few days later they move to a large fork of the tree and construct an ugly web. The family sticks together, resting in the tent during storms and the heat of the day, going out when it is cool for food. They are very easily killed when they are gathered in their tents.

When the larvae are fully grown they become more venturesome and strike out, hunting for protected places in which to spin tough, eval, white recouns. These, as well as the egg masses, can be picked off of trees easily and destroyed.

By contrast there is the peach-borer, which is said to do yearly damage amounting to \$6,000,000. The adult is a moth with skeletonized wings that look as if they were covered with varnish. The caterpillars bore in trunks and roots of peach-trees and also infect the wild cherry and willow

You can tell that trees are being bothered by this pest by large masses of gumexuded from the trunk where the caterpillars are working, usually near the ground. When the caterpillar has reached its full growth, it leaves its burrow and makes a cocoon of pieces of bark and silk on the tree trunk or ground. These cocoons can be removed and destroyed, but they are exceedingly well hidden and the damage already is done.

WO hundred and forty-eight varieties of butterflies and moths were found in Doctor Lutz's yard. These vary in size from those as big as a small fly to specimens of the gorgeous tiger swallowtall with its striking golden wings striped in black.

On a summer evening when you hear the chorus in the garden, you are most likely to appreciate the size of the vast army of insects there. The grasshoppers, for example, announce themselves by a peculiar rasping sound made by rubbing their hind legs against their front legs or by rattling their hind wings while flying. These extraordinary sounds, we are told, are love songs and their beauty is appreciated only by the female grasshopper, who is equipped with special sort of ears, one on each side of her abdomen.

Insects, just as human beings, often are misjudged from their appearance. The dragon-fly, for example, looks vicious, so we give it the innocuous title of "devil's darming-needle" or "borne-stinger." As a matter of fact, it stings perther horse nor man and is dangerous only to other insects. It catches these by swooping upon a victim and scooping it up in its legs, curved to form a basket.

The hundreds of insects in your garden all are interesting if you know how they live, what they eat, and how they grow On your window-screen there are pethaps 20 flies of different sizes. There are 20 different kinds of flies, for a little fly does not become a big fly. Insects do not grow after they have wings. Each of these 20 species has a story

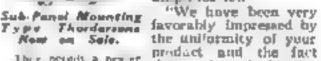
With the rich field of entomology just outside your kitchen door, in your own back yard, you have only yourself to blame for neglecting a fascinating study



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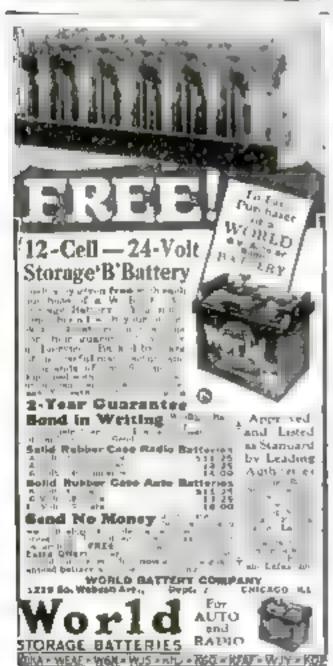
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#### Here Are Correct Answers to Questions on Page 55

- 1. Became the paper keeps the ice from melting and this interferes with the cooling effect of the ice. When ice melts it takes up and absorbs a certain amount of heat in the mere act of melting. This is what you use ice for; to take up heat
- 2. If the temperature of the body itself gets above 107 degrees, even for a short time, death is nearly certain. The body can withstand an outside temperature much higher than this.
- 3. Lack of air does not cause actual death until the tissues of the body have been without oxygen for some time and have suffered serious chemical changes as a result. If you restore breathing artificially before these changes happen, the tissues will recover.
- 4. We are not sure. Buts may have some extra sense we do not know of But accentists believe that buts possess extremely sensitive ears and can hear echoes reflected from walls, trees, etc
- 5. Because it stays the same height in the sky. Anything on earth, like the top of a church steeple, seems to sink lower toward the horison as you go away from it. Of course the moon is much too far away to do this.
- 6. The fundamental cause is that the water in the tropics gets hot and the water in the polar regions gets cold. This storts a circulation of the water
- 7 The color of clothes is usually due to dves. Dyes are very complex chemical compounds. Many of them are affected by light, changed into other chemicals.
- 8. The sign contains a great number of electric lamps, each one connected separately with a switch. These switches are mounted on a revolving cylinder like a barrel. This cylinder is turned by a motor. As it revolves the switches open and close. This makes the individual lamps on the sign light up and go out in succession to form designs.
- Because the gua-pipes are not always connected electrically with the earth.
- 10. In some kinds of plants this is caused by fall of temperature at night; in others it is caused by lack of light. These latter flowers will close up any time if carried into a dark room
- 11. One of the functions of the liver is to store up augar and hold it as food material which can be drawn out and used whenever there is an emergency. When the adrenal glands are preparing your body for a fight, one of the things they do is to affect the liver so that some of its stored-up augar is poured out instantly into the blood. This augar then becomes available as a quick food supply for the muscles in case they have to work very hard fighting or running
- dency to instate whatever we see other people do. If everybody around us is in a panic, or laughing, or running to a fire, it makes us want to do the same thing Yawning when other people do so is simply one instance of this tendency to imitate. It is such a common instance because yawning is an easy thing to do and one which we are much more likely to do than we are to get in a panic or run to fires.

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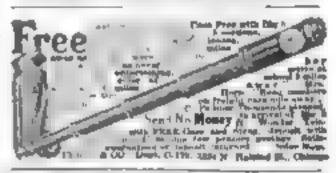
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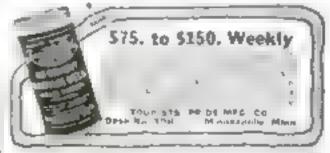


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#### Facts about Tuning Coils

(Continued from page 70)

Of course, other conditions might enter into any consideration of the effect of moisture, as far as the average radio set is concerned. In the first place, these test coils were absolutely clean-not covered with a layer of dust and grime that would help to keep the water in contact with the wire and even absorb it from the air. It seems fair to assume, however, that any radio set kept reasonably clean and in a house where the dampness is not so great as to injure the health of the inhabitants. should give good results so far as any effect of moisture is concerned.

In connection with the test of the comparative efficiency of silk, cotton, and enameled wire it might be well to point out that the material of the tubing on which the coll is wound probably is of great importance. At least, it is obvious that if the tube composition is of a type that tends to increase the high-frequency resistance, then the thinnest insulation would naturally give the greatest resistance, because it would allow the wire to come that much closer to the coil form.

The Popular Science Institute of Standards Radio Laboratory is now planning a series of tests on coil forms made from different kinds of material and the results of these tests will appear in a future icaue of POPULAR SCIENCE MONTHLY.

#### Recent Publications

Concerning the Nature of Things, by Sir William Bragg. A thorough explanation, making clear to the layman, through simple experiments and homely illustrations, the structure of atoms, gases, liquids, and crystals. Illustrated, Harper & Brothers.

Roper's Questions and Answers for Steam Engineers and Electricians. What a capable engineer should know. A handbook enlarged and brought up to date. David McKay Co.

Aspects of Science, by J. W. N. Sullivan. Essays explaining the fascination of science for the layman as well as the specialist. Alfred A. Knopf.

Man and Hie Affaire from an Engineering Point of View, by Walter N. Polakov, M.E. Williams & Wilkins Company.

Workshop Gauges and Measuring Appliances, by L. Burn. Isaac Pitman & Sons. The Painting Trade Handbook, by A.

Ashmun Kelly. A full synopsis of practical information, most useful to housepainters. Illustrated. David McKay Co.

The Personal Equation, by Louis Berman, M.D. Why one man is a genius and the next a nonentity. The influence of glands in determining individual character. Illustrated. The Century Co.

The Wonders of Electricity, by A. T. McDougall, B.A., B.Sc. Isaac Pitman & Some.

Henley's Workable Radio Receivers, by John E. Anderson and Elmer H. Lewis. Complete instructions for the construction of many of the standard forms of radio receivers, Illustrated, Henley Publighing Co.

Pioneer Incentions and Pioneer Patents. by Frank Keiper, M.E. Pioneer Publishing Co., Rochester, N. Y.

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bome gland treatment.

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two thirds, of all man part a certain middle age weller with a disorder of the Prostate Goand. And this little gland is directly responsible for many of the painful disorders commonly attributed to middle age.

Old Age Signs

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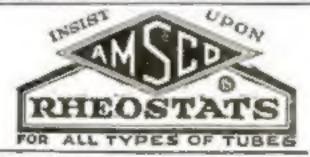
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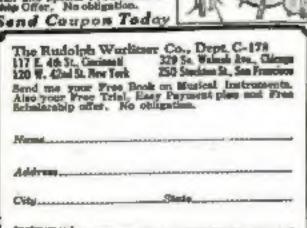
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### A Compact Two-Tube Receiving Set

of rhecetat G. From the other terminal of rheostat G run a wire around underseath variable condenser D to the remaining filament terminal of socket J and from there to the semaining terminal of socker K connecting, also, with binding post No. 5.

After this you should connect the lower terminal of call B with the stationary plates of variable condenser D, and connect the other terminal of coil B with the rotary plates of condenser D. Continue this wire to connect with the wire that

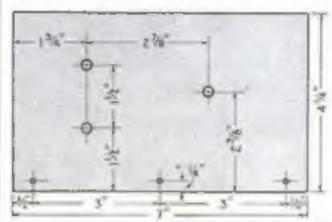


Fig. 9-The panel diagram, with the most measurements for laying out and drilling holes

joins the positive filament terminals of sockets J and K.

Now run a wire from the other end of the stationary plates of condenser D to one terminal of grid condenser E and connect the other terminal of condenser E with the grid terminal of socket J.

NEXT, connect one terminal of coil C with the wire from rheostat G that goes to the filament terminals of the suckets. Connect the other terminal of coil C with condenser F and run a wire from the other terminal of condenser P down to the plate terminal of socket J. with a branch over to the P terminal of audio transformer H. Now connect the grid terminal of transformer H with the grid terminal of socket K. After this you can run a wire from the plus-B terminal of transformer H down to binding post No. 6 and continue it on to hinding post No. 7. Then connect the plate terminal of socket K with binding post No. 8.

Connect one end of coil A with the wire from the filament terminal of socket K, which also is connected with the rotary plates of the condenser. Complete the wiring by connecting the other end of coil A with binding post No. 1.

To put the receiver into operation, connect the antenna wire with binding post No. I and the ground wire with binding post No. 2. The A battery is connected with binding posts Nos. 3 and 4; the positive terminal with No. 4. The B battery in connected with binding posts Nos. 5 and 6, the positive with No. 6, and the head-phone cord tips should be clamped under binding posts Nos. 7 and If the cord tips are marked "positive" and "negative" by means of a thread in one cord, be sure that this tip is clamped under No. 7.

Turn the rheostat all the way off and place the tubes in sockets J and K and the grid leak L in the clips on condenser E. Now turn on the rheostat Guntil the tubes

are burning faintly and then tune the set with the dial on condenser D and the knob on the shaft that turns coll C. Be sure that you keep the knob that controls the angle of coil C turned back to the point where the receiver does not howl,

THE efficiency of any receiver depends on the antenna you use and if you are a long way from any broadcasting station, the higher and longer the antenna, the better the results you will get. In building the case for your complete portable outfit, it will be well to figure on a coll of flexible wire about 100 feet long and if you find that there is no location for an antenna as long as this in your camp, then make the antenna as long as possible with the unused portion of the coil rolled up tightly at the far end of the antenna.

A good ground connection is just as important as a good antenna. A piece of wire thrown into a near-by brook or lake is the best obtainable. If you are not near water, then a very fair ground can be obtained by laying 100 feet of wire on the ground underneath the antenna, or you can drive an iron rod into the ground.

The frame of your auto also will give fair results as a ground connection and if you are using the storage battery in your car to light the tubes in this portable set, no special ground connection with the frame of the auto will be necessary.

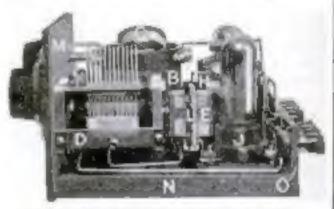


Fig. 9-View from the right end showing clearly the book-up of the tuning condenser

#### "Bottling" Wireless Messages

ATTRELESS memages now can be "bottled" and preserved indefinitely, it is claimed, as a result of a new German invention. A long steel wire wound on a speel serves as a record. By means of a motor this wire is passed through a powerful magnetic field, which varies in intensity according to the transmitted impulses. In traversing this field, the wire is magnetized and the various sounds literally are "frozen" upon it. The magnetized wire can be reversed and run past a soft iron core which, in turn, is magnetized, creating a field of magnetism itself. The wire duplicates the fluctuations impressed upon it and gives back through telephone receivers the sounds originally made.

#### New Finish for Autoa

A UTOMOBILES now can be refinished quickly by spraying on, with compressed air, a very durable finish made of much the same material as that used for the backs of imitation ivory toilet articles.

#### Summer's the Time to Overhaul Your Set

(Continued from page 68)

as possible, means that either the plates are badly sulphated or that the positive plates are going to pieces. A storage A battery can be overhauled, but it is practically as economical to buy a new battery.

The sound-producing part of your equipment—the head phones and loudspeaker-should be left strictly alone. Do not try to take them apart or try to adjust them except, of course, for the usual spacing adjustment fitted to many loudspeakers. This rule does not prevent you from carefully inspecting the flexible cord, and if you find the fabric broken or frayed, the whole cord should be replaced.

Like any other piece of delicate apparatus, a radio receiver responds to intelligent care and it pays to watch for troubles that may stop your reception some evening just when you are trying to show friends how well your set works.

#### Resistance of Water Found

THE resistance of water to electric currents increases in the same measure as its purity. This does not mean, however, that absolutely pure water is an insulator. It has been determined that chemically pure water offers a resistance to electric current which is 45,000,000,-000,000 times that of copper. A column of pure water .039 inch long and .039 inch square in cross section offers the same resistance as a copper wire .039 inch square in cross section and 27,000,-000 miles long—more than 100 times the distance from earth to moon.

#### What Becomes of Pins?

IT SEEMS almost incredible that each person in the United States uses 200 pins a year, yet according to the output of the 10 large factories supplying the great demand for pins in this country, the United States now uses more than 20,000,000,000 plas a year.

ANTE do not like castor oil, for Brazilian agricultural experts have found that the glowly burnt seed of the castor-oil plant produces fumes that not only kill the ants, but prevent the next from being reinfested.

REMAINS of a hitherto unexplored prehistoric city of the cliff-dwellers buried under water when Roosevelt Lake was formed by the erection of the great Roosevalt Dam were exposed by recent droughts which lowered the lake level.

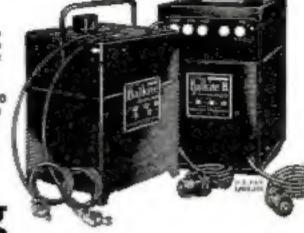
PART of the heart muscle of an unborn chicken has been kept alive in a test tube for 14 years, according to the recent statement of Dr. M. J. Sittenfield of New York.

FRENCH chemists have developed an artificial resin from which panels for radio eets are to be made.

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